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Chemical Weekly

VOL. XXXIV

MAY 23, 1989

NO. 37

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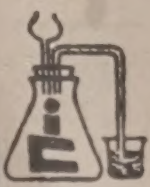
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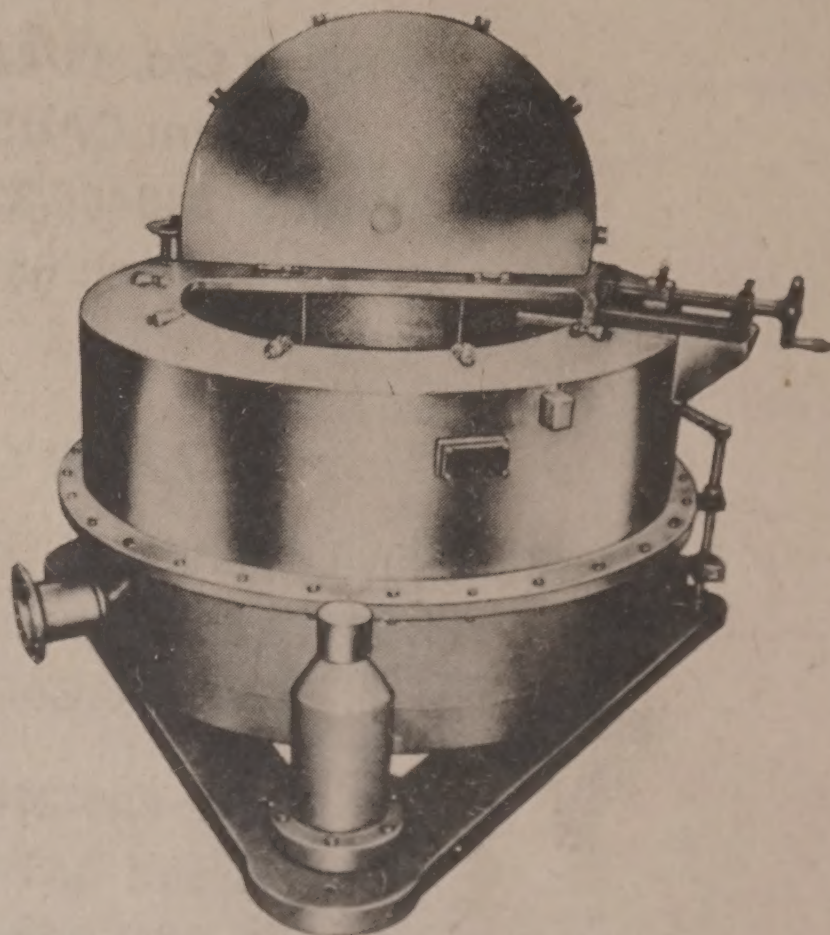
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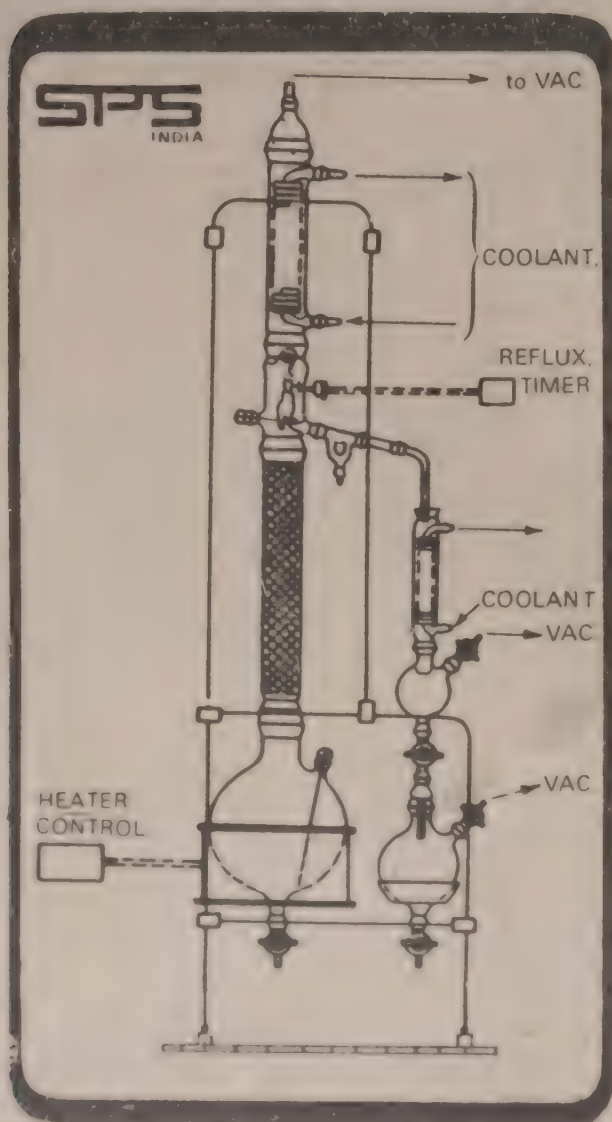
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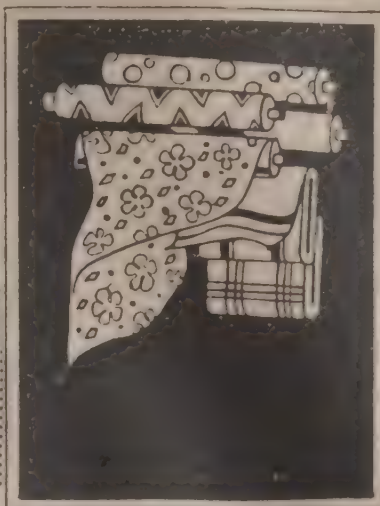


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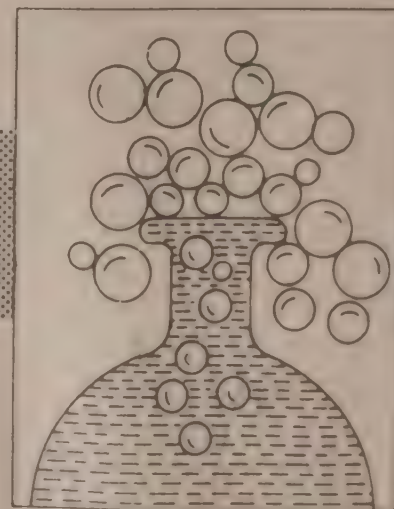
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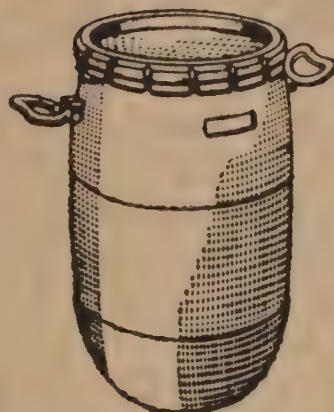
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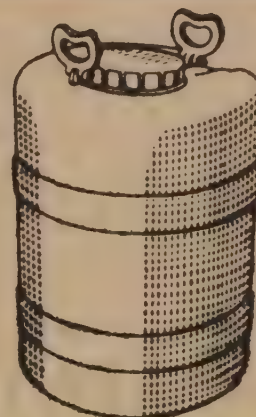
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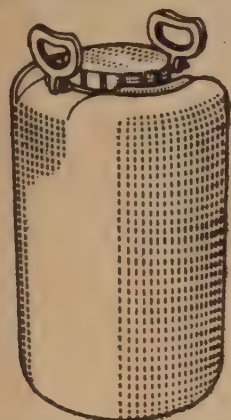
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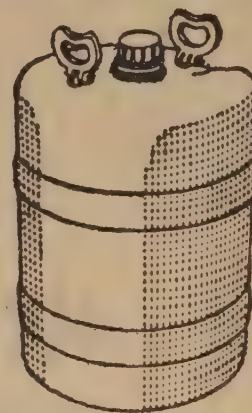
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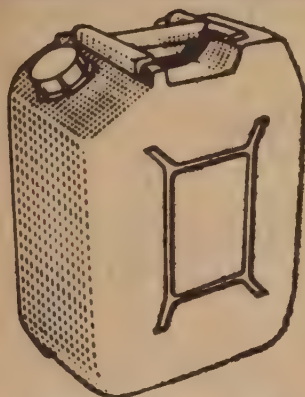
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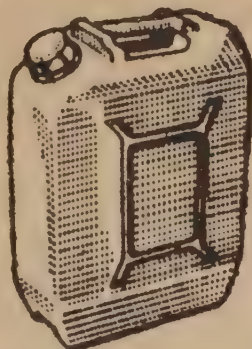
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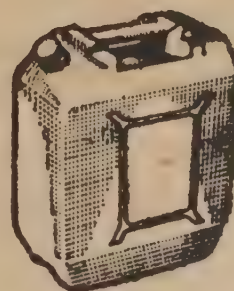
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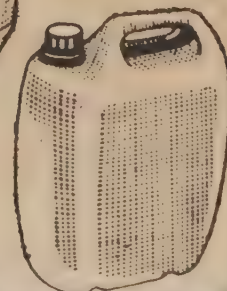
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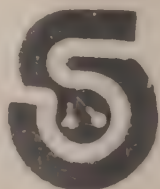
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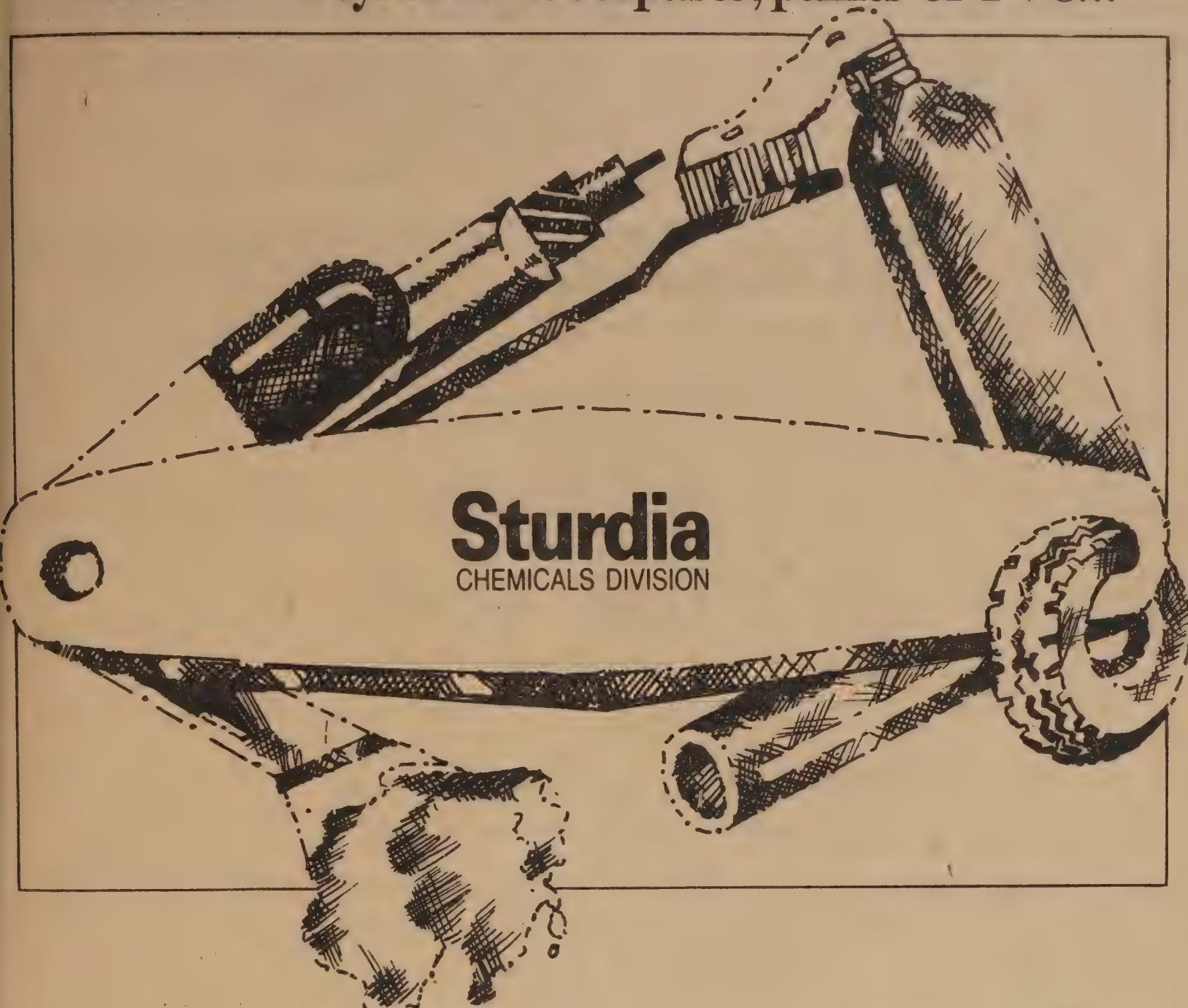
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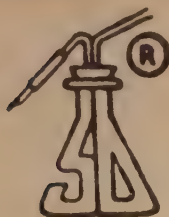
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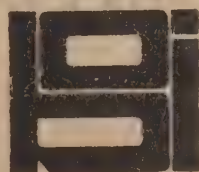
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HERALDING THE 21st CENTURY - 21

Meeting the energy crisis — a shift away from the fossil fuels

The energy crisis of the seventies taught man the fallacy of his excessive dependence on fossil fuels and this led to accelerated research on the problems of utilisation of renewable energy sources. Renewable energy sources is a term that is often used to cover direct solar heat, water power, wind power and biomass or combustible material from photosynthesis.

Renewable energy critics raise several objections: (i) Renewable energy systems produce little nett energy — i.e. more energy goes than comes out. (ii) They are intermittent, (iii) You have to consider problems of energy storage, which in some cases are insurmountable. Renewable energy technologies intercept natural energy flows and use them for human purposes. This has been done for millennia, the only new thing is that modern technologies have higher conversion efficiencies and lower costs. Most of these natural energy flows are derived from solar radiation striking the earth. The resource, though dilute, is certainly abundant — some 44,000 quads fall on the United States alone each year. Variation between clear, sunny regions and cold, cloudy ones is surprisingly small — annual totals per acre or square foot vary by less than a factor of two.

Renewable Electricity: The renewable electric technologies being considered are: (1) hydroelectricity, (2) geothermal electricity, (3) photovoltaic electricity, (4) other solar-electric technologies, (5) wind-electric systems, (6) industrial cogeneration with biomass fuels.

Hydroelectricity: Falling water has been used as an energy source for thousands of years and as an electricity source for a century. Hydro power is generally the cheapest source of electricity. Most of the prime large dam sites have already been developed in the United States. Rising real costs of electricity have restored competitiveness to many small sites with dams.

India too was among the pioneers in the development of hydroelectric potential. A realistic reappraisal of the Natural hydroelectric resources places the figure at the equivalent of 396 TWh (One TWh = 1000 million Kw). Schemes presently in operation account only for 12% of the figure. Controversies regarding environmental disasters, fears of earthquake or recurring earth tremors (Idiki and

Koyna) have been hampering the growth of this sector. The current emphasis is on the development of micro/mini/and small hydrostations.

Geothermal electricity: Geothermal steam has been used commercially to generate electricity at Larderello, Italy, since 1904. Low-temperature geothermal resources are being developed rapidly for space heat. Some researchers would not include this resource among renewable energies on grounds that it is subject to depletion. It seems, though, to be capable of producing heat indefinitely if withdrawal rates are carefully established. "Old Faithful" in Italy has been releasing heat to the atmosphere for over eight and half decades.

In India, ONGC have plans to start a 1000 KW geothermal station at Cambay as part of their non-conventional energy development programme. Over 300 hot springs are known to be distributed over peninsular India. Of all these, Puga Valley in Ladakh is a potent, economically viable source of geothermal energy. A 7 Mw geothermal station was completed in 1977. Manikaran in Himachal Pradesh, Tatapuram hot springs in Madhya Pradesh, Suraj Kind in Bihar, Bakreshwar and Tatloi in West Bengal, Jerwai in Assam, a few in Maharashtra are among the better known. Costwise a 30 Kw geothermal unit with a load factor of 90% may cost about Rs. 5 crores.

Photovoltaic electricity: Photovoltaic cells depend on properties of semiconductors to convert radiant energy into electricity. Conversion efficiencies have a theoretical maximum of 23 percent; commercially available cells reach 15 percent. This is an important matter, for it governs the space requirements of photovoltaic systems and their ability to meet relatively concentrated energy demands with solar electricity. A square foot in New York City receives about 130 kilowatt hours of thermal energy in the course of a year. It makes a great deal of difference if 15 percent rather than 1 percent can be converted into a usable energy form.

Photovoltaics seemingly have been three to four years away from high volume commercialization every year since about 1977. They will seem to be some years away from competitiveness with conventional electricity sources. They are, of course, already a com-

mercial success for remote installations using relatively little power. The lowest prices reported in 1985 are in the range of \$4-5 per watt of peak (midday) power. Most sales are of crystal silicon cells. Several different versions are moving steadily towards commercial-scale production, with probable prices in the \$3 to \$4 range—one that opens a vast market now filled by diesel generators all over the world. There is virtually no disagreement with the proposition that PV's will, within the decade, become a competitive source of electricity.

Other Solar-Electric Technologies: There are other ways of converting solar radiation into electricity. The "Power Tower" in California is an example. A field of mirrors focuses on a boiler atop a tower. A working fluid is heated, which in turn makes steam to drive a turbine. The hot fluid also may be stored to generate electricity at night. The initial plant was very costly, but it seems to work well. Some industry analysts think that it can become competitive. Other solar-electric plants use concentrators (dishes or parabolic troughs) to heat working fluids nearer to the ground than the "power tower". The fluids, also make steam to run a turbine. One such plant now operates in the California desert and another is under construction—with considerably lower costs. The latest installation has a capital cost approaching the average capital costs of nuclear plants entering service in 1986.

A simple but promising idea is the solar pond, developed in Israel. If the bottom layer of water is heated by the sun and then prevented from rising (in most cases by the addition of salt, which makes the bottom layer too heavy to rise when heated), then heat can reach usable temperatures and be stored in the pond. Electricity can be generated, or, for that matter, any low-temperature heat demand can be met. Once this principle was discovered, natural solar ponds were found to have been there all along. This is a land-intensive technology with a fairly low conversion efficiency, but it is well suited to arid areas where land has few alternative uses.

Wind turbines: Wind energy for pumping water and to propel vessels have been in use for centuries. Wind electricity from small machines has long been cost-effective in remote locations. Machines in the 30-100 kilowatt class are nearing unsubsidized competitiveness for supplying the grid. Electricity is produced at costs of 12-15 cents per kilowatt hour when the effects of tax benefits are removed. Large machines, which have received virtually all of the federal research support, have not yet operated successfully for long periods. The California Energy Commission has reviewed the experience with windpower to date and the prospects for cost reduction with further operating experience and mass production of machines. The commission concludes that windpower, along with hydroelectricity, will be one of California's lowest cost sources of electricity by 1990.

Tidal electricity: Tidal power is not a huge resource worldwide, but it is locally important in the United States (New England and Alaska), the United Kingdom, France, India (Kutch and Cambay) the USSR, China, Korea, Canada, and Argentina. The technology for generating electricity clearly works; a 240-megawatt plant has run in France since 1965. This technology is probably competitive in most places; most North America operating data will soon be available from a pilot installation in Canada.

Biomass-fired cogeneration: The most important examples of

biomass-fired cogeneration are found in the forest products industry where wood wastes are burned to provide process heat. Investment projects work their way through the capital budgeting process, electricity generation equipment is being added with boilers. Hydroelectricity sources already provide 14 to 15 % of U.S. electricity. More new capacity comes into service each year. Geothermal capacity is approaching 1,500 megawatts, and wind capacity exceeds 1,100 megawatts. Both are concentrated in California but are found also in Hawaii and other western states. power development is also under way in New York and New England. Cumulative production of photovoltaic capacity is some 100 megawatts.

Biomass Energy; Liquid Fuels: Biomass represents another renewable resource. All plant matter can be turned into liquid through various chemical processes. Some plants directly yield crops, oils similar to diesel fuel or lubricating oils. Methane (natural gas) is produced almost any time decaying biomass and temperature are in the right range. Swamps, landfills, and sewage plants make methane. Modern technology enters to control the process, maximize yields, and reduce costs. The technology exists to work to derive methane from numerous other sources including manure, dairy manure, food processing wastes, or even energy crops like water hyacinths. Commercialization awaits further increase in natural gas prices and further cost reductions in the process. India and China have made notable progress with biogas.

Fuel alcohol (ethanol) made from sugarcane in Brazil and from corn in the United States represents the largest volume of biomass-based liquid fuel now being produced. Production in the United States in 1985 was estimated at 625 million gallons. Large subsidies keep the process viable in the United States, although some new technologies have probably made ethanol viable without subsidies. Most observers, however, think that the most promising large-volume liquid fuel from biomass will be methanol "wood alcohol".

Long Term Perspective in India: The Department of Non-conventional Energy Sources (DNES) has prepared a perspective plan for the development of non-conventional energy sources upto the year 2001. The following cumulative physical targets have been proposed in the plan in respect of various energy sources:

1. Power from Biomass	6000 MW
2. Power from wind	5000 MW
3. Power from Solar Energy	2000 MW
4. Power from small hydro	2000 MW
5. Improved Chulha	100 Million
6. Biogas Plants	12 million
7. Energy Plantations	2.5 Million
8. Power from Sewage Sludge	50 MW
9. Solar Thermal Systems	20 MTCR saving
10. Photovoltaic Pumps	15 MW
11. Wind Pumps	50 MW
12. Wind stand alone systems	10 MW
13. Energy from distillery wastes	140 projects
14. Energy from Municipal Solid Wastes	160 MW

On this basis it has been estimated that an annual energy generation or saving of about 250 million tonnes of coal replacement is possible by the year 2000-2001, working out to about 20% of the projected overall energy demand for the decade in the country.

-- T.P.S. RAJAN

CHEMARENA

L. VENKITESWARAN

Disposal of Wastes

"Waste generation is a fact of life" and the problem is their disposal, safely and without damage to life or environment more so when they arise from chemical process industry. Some of the wastes are toxic and potentially harmful to the water sources from underground wells, as happened with some of the waste dumped underground in earlier years --viz. Love Canal. The dumps of chemical wastes of the past decades are in thousands and the "superfund" programme for their removal has been launched in USA since last few years. Some of the wastes are dumped into the sea further from the coast line while some combustible toxic material is incinerated on land or in the sea. But the most deplorable practice has been the surreptitious dumping of wastes in third world countries through chosen contractors. It is only recently that this nefarious practice attracted public attention.

It is therefore appropriate that a well attended conference was recently held in Basle, Switzerland under the auspices of the UNEP -- United Nations Environment Program -- and evolved a scheme for international control on transport and disposal of wastes. 116 countries including USA are said to have given their assent to a treaty titled "The Basle Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal". The treatment aims "to protect by strict control, human health and the environment against the adverse effects which may result from the generation and management of hazardous wastes". This is not a legally binding document until ratified by the governments and mere acceptance is not enough. Fortunately, 35 countries including EEC countries -- who are among the main culprits -- are expected to ratify and the treaty comes into force when 20 of the signatory countries ratify within 12 months. While emissions of gaseous pollutants into the

atmosphere and their movements pose more serious problems on control, these liquid or solid wastes and their movement and disposal are possible to control only if there is a will. 40 African countries who attended are expected to decide on ratification at an OUA -- Organisation of African Unity -- meeting soon.

The documents lists 18 categories of waste streams and 27 chemical classes of wastes and also specifies hazardous characteristics and recommended methods of disposal. The treaty will be enforced under UNEP and coordinate movements between countries and identify illegal trafficking in waste. There cannot be any export-import or transport of chemical waste that is not recorded and known. Imports of wastes into countries lacking the legal administration and technical organisation to dispose of the wastes will not be permitted". But much has to be done. What constitutes environmentally sound management is not clearly defined. But the licensing of movements at a high enough cost is likely to stimulate better disposal by recycling and recovery of valuables and reduce wastes to a point of elimination in due course. Liability of the polluter on wastes illegally transported or dumped has yet to be spelt out.

The provisions of the treaty will be reviewed and revised continuously for effective implementation. It is possible for much of the wastes to be pooled for proper treatment and recovery of useful components through a central unit when disposal or treatment is too costly for individual producers. Such contract processing and disposal is a flourishing business in some western countries and could be a step which India's numerous chemical producers with wastes should consider and organise.

Nuclear Fusion at ambient temperature?

Of late scientists are tempted to hit newspaper headlines when there is a sensational discovery even without waiting for the normal channels for scientific communications through standard journals. Witness the spate of claims regarding super conductivity at higher temperatures over the past two years. This "Instant Science" is a flagrant violation of the normal strict protocols for dissemination of results of basic research or a breakthrough which is unexpected. What is termed "peer review" is the basic step for acceptance for publication. No

doubt, claims for patent rights of a potentially commercial discovery is tempting and some succumb to it and dates of communication are vital. New discoveries such as that on super conductivity or AIDS have been generally presented to the public but with appropriate caution.

The latest in this area of announcement to the press is by two scientists of the University of Utah in Salt Lake City, USA of a simple experiment which indicated nuclear fusion

at ambient temperature -- something which is astonishing and well-nigh impossible as per known theories. In fact the fusion of atomic nuclei requires such extremely high temperatures as on solar surface that are beyond the ability of any known material to withstand. Magnetic containment of the heat energy in what is called Tokamak reactor is one way which is under investigation for several years now with little success. But Martin Feischman of University of Southampton, UK in association with Dr. Stanley Pono of Chemistry Department of University of Utah claim that electrolysis of heavy water with thin palladium electrodes show indication of fusion of two deuterium nuclei into helium or tritium with release of energy and protons.

Deuterium is very soluble in palladium and the ions diffuse into the metal matrix to such an extent and can be tightly packed that a quantum mechanical effect known as "tunneling" enables the nuclei to overcome mutual repulsion and fuse. It is said that 4 watts of energy for every watt input arises with heating up of the liquid to levels not accounted for by any chemical reaction. The energy output is also proportional to the volume of palladium and not its surface area -- 26 watts per cu. cm. of palladium.

Pons and Feischman report that a paper had been published in Journal of Electroanalytical Chemistry weeks before the Press meeting and a note was also in Nature. They state that distorted, inaccurate information leaking out that they decided to make this public announcement. They also feel that attempts to repeat the experiment without the required conditions may be hazardous. The uptake of tritium and the gamma ray emissions caused by neutrons have been reportedly measured. The energy of gamma ray corresponds to what was theoretically expected.

There are reports of the electrolytic experiment being repeated including one at TIFR in India. It will be quite some time before one can expect final confirmation or contradictions. Excitement is high, both among scientists and on others who expect progress towards an era of plentiful energy without pollution and no limitation of resources. But this aspect of commercial low cost power is more of a mirage than the claims of the experiment. If one has to choose heavy water and palladium for the energy output it cannot be cheap. The level of energy release in a medium like heavy water is apparently too low for any energy programme to take shape. We should certainly expect more details on this "cold fusion".

Super absorbents for the garden

Super absorbents are special polymers which have the ability to absorb up to several hundred times its weight of water and remain in the same shape. Obviously these super absorbent materials form the basis of many toilet/personal hygiene items and for hospitals and such uses are a big profitable market. It was also realised from the beginning that they could be useful in agriculture, particularly at times of seed germination. Such use has not been significant so far until the applications for gardening and horticulture were promoted. The Department of Agriculture and Horticulture of Cornell University of Ithaca has been foremost in this field.

There are different polymers;

- i) Starch with grafted acrylo polymers originally developed by Northern Regional Research Laboratory, Peoria.
- ii) Polyvinyl alcohols; alone or blends.
- iii) Polyacrylamides

Starch and PVA absorb more water but polyacrylamides of the series are more stable in repeated wetting and dewatering cycles and to fertilisers in soil. Starch based absorbents are more easily attacked by bacteria with a life of under 2 years while polyacrylamides last upto 7 years.

Agluton Agri Products, Congers, NY have perhaps the better products with long life, ability to release moisture, resistance to both ultra violet light and fertilisers. Their product is a blend of acrylamide, acrylic acid and polyethylene. Schering of West Germany also makes and markets in USA along with other European producers like Allied Colloids of UK and others. American Cyanamide and Industrial Services International are also prominent suppliers. Use for gardens is estimated at one million pounds of value \$8 million. More extensive use in agriculture could boost the market if available at lower prices. Besides garden the growth of trees and saplings for forestation are areas of wider use.

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RS. 180-CRORE NYLON 66 PLANT

Thapars make fresh offer

In an attempt at reviving the Rs. 180-crore nylon 66 proposal with the government, the Thapars have offered to ensure that the foreign exchange outgo on the project will be lower than any other nylon tyre cord (Nylon 6) unit in the country.

The Thapars are also willing to accept a fixed export obligation of around 40 per cent.

In an alternative proposal, they have offered to undertake a flexible export schedule that will be pegged to the foreign exchange outgo of the other units. In other words, this means that if the import content of other nylon units comes down relatively, the Thapars will be obliged to export more.

The Thapars intend to set up the unit in collaboration with Du Pont, the US chemical conglomerate. Du Pont and Thapars will each have 40 per cent equity in the enterprise.

The new Thapar proposal is an attempt at countering allegations by existing nylon 6 manufacturers that the project will entail a perpetual drain on foreign exchange. The high import content was cited as one of the reasons by the government for rejecting the proposal recently.

In their new proposal, the Thapars have claimed that with 40 per cent export obligation, the foreign exchange outgo on raw material imports on their unit will be two-and-half time less per tonne of finished product as compared to existing manufacturers. The Thapars say that 50 per cent of the caprolactum (which is the raw material for existing manufacturers) will still be imported four years from now despite fresh capacity that will come up.

It has been calculated that demand for caprolactum by filament yarn, industrial

tyre cord and nylon moulding powder units will be in the vicinity of around 1.36 lakh tonnes by 1993 while indigenous production will not exceed 75,000 tonnes.

The Thapars have based their projections on the assumption of 100 per cent import of their raw material (AH salt) requirements. But Du Pont is reported to be willing to licence AH salt production in the country. A few Indian companies have also written to the Thapars that they are prepared to make the salt in the country in the required quantities.

The Thapars say that out of a total cost of Rs. 180 crores, only Rs. 30 crores worth of equipment will be imported. Out of this, Rs. 21 crores will be new machinery while an additional Rs. 7.8 crores worth of equipment have been refurbished and all moving parts replaced by new parts. Only Rs. 1.2 crores worth of machinery can be termed to be old, it is claimed.

The Thapars claim that the plant comes with the latest spindraw technology and performance guarantees from Du Pont. All consumption and production norms are reportedly as per those for new equipment.

It is also maintained that the net initial foreign exchange outgo on the plant will be only Rs. 7 crores, because Rs. 23 crores of foreign exchange will be contributed by Du Pont by way of equity capital.

The Thapars also say that with the improvement in nylon tyre cord demand in the West, Du Pont, at one stage, was reluctant to sell the plant to the Indian business group, and instead offered a new plant that would have entailed a cost of Rs. 300 crores. But the Thapars resisted the move on grounds of cost and not efficiency.

**NYLON TYRE CORD FABRI
CENTURY ENKA ALLOWED
EXPAND CAPACITY**

The Union government has allowed Century Enka Ltd. to undertake a sizeable expansion of its nylon tyre fabric production from the existing tonnes per annum (tpa) to 7100 tpa. The project for expansion of capacity involves an investment of Rs. 13 crores. According to official sources, the company proposes to finance the project through the issue of debentures, foreign exchange loans, internal accruals and loans from financial institutions and banks.

Of the total cost, Rs. 13 crores would be raised through debentures, Rs. 2 crores through foreign exchange loans, Rs. 9.52 crores from internal accruals and Rs. 13 crores from financial institutions and banks. Officials said that considering the company's proposal, the government noted the fact that the item of manufacture was covered under Appendix-I to the industrial policy. Large industrial houses, it was noted, were normally eligible to take up item of manufacture.

Further, the proposal for expansion was largely aimed at matching nylon tyre cord capacity available with the company with that of nylon tyre cord fabrics' demand. Sources said that no commitment for financing the project by the financial institutions should be assumed either for the whole or for part of the requirements. Any loan sanctioned by them will be subject to the terms and conditions, including appropriate debt-equity ratio and conversion option, as may be acceptable to them.

Similarly, the quantum and availability of foreign exchange loans would be subject to the prior approval of the department of economic affairs. Likewise, the import of capital goods and their financing would be subject to government approval.



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AABIDA plea for perspective plan

The All India Alcohol-based Industries Development Association (AABIDA) has called upon the Government to commission a perspective plan for chemicals based on alternative feedstocks.

The Kapur Committee had drawn up a perspective plan for chemicals based on naphtha and gas. Numerous committees studied the scope of chemicals based on alcohol and molasses.

"However, no committee has yet undertaken a comprehensive study of all types of feedstocks available and which chemicals and polymers should be made from which feedstock", said Dr. S.K. Somaiya, AABIDA President.

Such a study will answer questions like the following: what do we do with the glut of molasses and alcohol in the country? Do we continue export of alcohol and try to export molasses? Is it possible for India to become a world leader in alcohol-based chemicals?

Addressing a seminar in New Delhi on "Alcohol-based industries in the 90s" he referred to the sea-change that has taken place during the last two years in regard to the availability of molasses and alcohol in the wake of the new sugar policy announced two years ago giving boost to the sugar production in the country.

Nature has also cooperated in implementation of the new sugar policy. During the crushing season 1987-88, the production of sugar in the country was 91 lakh tonnes surpassing all previous records: in the current crushing season 1988-89, it is expected that we shall have a sugar production of 95 lakh tonnes; and from next year onwards our production would be over 100 lakh tonnes, save for any natural calamity. As a result, there would be abundant and ever-increasing availability of molasses and alcohol. In fact, we may be in an era of glut of these two products.

As it is, with 95 lakh tonnes of sugar production in the country this year, we would have an availability of 40 lakh M.T. of molasses and with a carry-over of 5 lakh tonnes i.e. with total 45 lakh tonnes we would have a potential capacity of a 1000 million litres of alcohol. Thus the targets visualised at the time of the Bhattacharya Committee Report in 1980 of requirement of 1000 to 1100 million litres of alcohol for 1989-90 are virtually on the verge of being realised.

This throws up a new challenge before the planners and the policy makers viz. of how best to utilise this available raw-material in the coming decade.

The biggest constraint in the capacity utilisation of the alcohol-based chemical industries has been the high cost of inputs which is eroding the cost-effectiveness of alcohol as a feedstock. This factor assumes all the greater

Projections of Sugar, Molasses & Alcohol Production at the end of VII 5 Year Plan (1989-90)

State	Sugar Production (M.T.)	Molasses Production	Alcohol Production (in kilolitres)
Assam	3,000	1,260	249
Andhra Pradesh	6,74,000	2,83,000	56,050
Bihar	4,50,000	1,89,000	37,422
Goa	9,500	3,990	790
Gujarat	7,54,000	3,16,680	62,703
Haryana	2,60,000	1,09,200	21,617
Kerala	12,000	5,040	998
Karnataka	8,16,000	3,42,720	67,859
Madhya Pradesh	70,000	29,400	5,821
Maharashtra	31,13,000	13,07,460	2,58,877
Nagaland	3,200	1,340	265
Orissa	21,000	8,820	1,746
Punjab	2,67,000	1,12,140	22,204
Pondicherry	75,000	31,500	6,237
Rajasthan	15,000	6,300	1,247
Tamil Nadu	9,58,000	4,02,360	79,667
U.P.	26,31,000	11,05,020	2,18,794
West Bengal	1,350	567	112
	1,01,33,050	42,55,877	8,42,658

importance in the changed context of easy availability of molasses and alcohol.

The new molasses - alcohol policy announced by the Government in August 1987 has now been in operation for nearly over 18 months. The salient features of this new policy have been as under:

(a) No decontrol of molasses -- the present regulatory control on distribution and prices of molasses and alcohol to continue; (b) Grant of full rebate of total Central Excise duty on specific alcohol-based chemicals; (c) Free capacity for manufacture of potable drinks would be permitted only on non-molasses based raw materials.

"While AABIDA is thankful to the authorities for this pragmatic and enlightened policy, we would like to categorically state that the problems of Alcohol-based Industries are not fully

solved," he said. Among the factors contributing to the erosion of cost-effectiveness of alcohol, the following are, by far the most important, which will need to be tackled effectively:

i) The high level of State levies on industrial use of alcohol in contrast to the recommendations of the Dr. Bimal Jalan Committee to have only a nominal fee of a few paise per litre to defray the cost of administrative expenses; ii) The ever-increasing cost of fuel i.e. coal, furnace oil etc. and of power which are having cascading effect on the cost of the feedstock; iii) Tendency to charge higher prices of alcohol, not justified by the formula evolved by the Government; iv) Sporadic demand from different sections of the sugar industry asking for "increase" in the price of molasses and/or for "decontrol" or "partial decontrol" of molasses.

AABIDA would like to reiterate with all the emphasise that the viability of the alcohol-based chemical industries depends entirely upon the continuity of supply of molasses and alcohol to the chemical industries at "stable, uniform and affordable prices".

"It is in this context that AABIDA has been insisting that it is time for us to clearly enunciate and evolve a "National Alcohol Policy" to fully utilise this renewable and ever replenishable feedstock.

The most important, components, among various others, of such a national alcohol policy would be the following:

i) To ensure smooth availability, distribution and flow of alcohol among different States without inter-State restrictions or burden of export-import pass fees and various States levies; ii) To rationalise the structure of State levies and duties on molasses and alcohol and bring uniformity at a reasonable level and in line with the recommendations of the Dr. Bimal Jalan Committee; and iii) To maintain a

price-parity and viability of molasses and alcohol as a critical feedstock in the context of other competing feedstocks.

Plan to promote alcohol as fuel

The Union Minister of State for Petroleum and Natural Gas noted at the seminar that the Union government is examining the possibility of using alcohol as fuel in the transport sector. In view of the projected surplus availability in the country, the proposal envisages the use of this cheap source of fuel, mixed with petrol or diesel, in vehicles.

The minister, however, did not give any details in this regard apart from saying that the proposal was being considered by the ministry of petroleum and the department of chemicals and petrochemicals.

The minister maintained that some studies had been conducted for using alcohol as engine fuel. The Indian Institute of Petroleum had done pioneering

work in this direction. The thrust of these studies is on part substitution of petroleum fuels by alcohol.

Part substitution, the minister said, had the advantage of being a flexible option as the vehicles could be operated either on alcohol and petroleum fuels together, or on petroleum fuels alone. At the same time, he said, fuel substitution of petrol or diesel required specially designed engines which had to be built at the manufacturers premises.

Another exciting alternative, he said, was to produce methanol from natural gas. According to him, studies were being conducted to develop cheaper and less energy intensive processes like the enzymatic route for conversion of natural gas into methanol. The minister took pains to emphasise the need for an integrated policy for development of alcohol based industries. This was necessary for optimum utilisation of sugar cane and molasses besides reducing pressure on petrochemical products.

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Promoter for Shahjahanpur to be finalised soon

The special committee of secretaries on fertiliser projects is meeting in New Delhi on May 23 to decide on the promoter for the Rs. 750-crores gas-based fertiliser plant at Shahjahanpur.

The prime bidders for the project are: the Krishak Bharati Co-operative Limited (KRIBHCO), the Rashtriya Chemicals and Fertilisers (RCF), Oswal Agro and a non-resident Indian, Dr. B. Pande, a leading heart specialist in the US and executive vice-president of the US-based Shakti International Resources Incorporated.

Until last year, the letter of intent for the project was held by another non-resident India, Mr. Swraj Paul.

KRIBHCO has staked its claim to the project on the basis of its sound financial position. It had paid dividend amounting to Rs. 13.84 crores for 1986-87 to its member-co-operatives, including Rs. 10.32 crores to the Union Government.

The society had also paid an advance of Rs. 90 crores to the government and had liquidated the entire loan amount of Rs. 79.75 crores drawn from the Industrial Development Bank of India (IDBI) and other financial institutions within three years of commencement of commercial production.

KRIBHCO is already executing an ammonia extension project in Hazira

with an estimated cost of Rs. 223 crores. The zero date of the project is August 11, 1986, and the completion date is November 1, 1990. The project is reportedly several months ahead of schedule.

KRIBHCO has told the government that it would be able to put up the Shahjahanpur project from its internal resources without any budgetary support. RCF is also reportedly enjoying good financial health. However, the government is aware that it would need adequate budgetary support for putting up the project.

Oswal Agro has also staked its claim to the project on the basis of its financial strength. Its annual turnover for 1987 was Rs. 200 crores and exceeded Rs. 300 crores in 1988. Based on the current market price, the net worth of the group companies stands at Rs. 300 crores.

According to the application submitted by the group, it has surplus funds to the extent of Rs. 100 crores which can be gainfully utilised in the project. It has said that the group will be willing to invest further annual accruals for the purpose.

In his application for the letter of intent, Dr. Pande has offered to meet the entire foreign exchange requirement of the project. He has also offered to

arrange all the funds required for share of equity.

UNICORN ORGANICS SORBITOL PROJECT COMMISSIONED

The Rs. 8.5-crore project of Unicorn Organics Ltd. (UOL) for manufacture of high quality sorbitol has just gone on stream. In spite of the delayed commissioning of the project there has been no cost overruns.

Addressing newsmen at Hyderabad on May 17, Mr. Bhanubhai Sanghani and Mr. Sanjay Sanghani, Managing Director and Executive Director respectively of Unicorn Organics said the samples of the product were approved and it was heartening for the management that the quality of sorbitol matched high international standards.

Chemical analysis carried out revealed that the content of D-glucitol has been as high as 69.6% and the reducing sugars at only 0.8-0.11%. During the next 6 months, the plant will operate at 12 tonnes per day capacity after which it will be doubled. Sales during the ten & half months working are estimated at Rs. 6.4 crores with profits before depreciation and taxes being Rs. 111.89 lakhs. All these estimates will be attained, Mr. Sanghani said. In a full operational year (1990-91) sales will be Rs. 9.25 crores. In addition to traditional applications new areas are also being explored to lead to future diversification.

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Oswal Agro's LDPE unit begins production

The 12,000 tonnes a year low density polyethylene (LDPE) plant of Oswal Agro Mills in Rishra, West Bengal has begun commercial production. The petrochemical division of the company has started selling the material in Calcutta.

The plant, formerly owned by Indian Explosives Ltd. (IEL, and ICI India) had been out of operation for the last few years. It is based on ICI technology and uses molasses alcohol as feedstock. The plant would consume about 40 million litres of alcohol a year. The company has a two-year arrangement with the Uttar Pradesh Government for supply of alcohol. It may be possible to enhance LDPE production to 15,000 to 20,000 tonnes a year after debottlenecking the plant, according to observers.

The naphtha cracker of the former Union Carbide Chemicals and Plastics unit in Chembur, Bombay, also taken over by the Oswal group is now undergoing trial runs. This unit is expected to begin production by July-end. The staff, idling ever since Union Carbide closed down the plant, are giving their best to see that the plant goes on stream at the earliest.

The new management is said to have spent about Rs. 10 crores in replacing piping insulation and corroded components, besides installation of additional safety equipment. The public sector Engineers India Ltd. is actively involved in recommissioning the unit and will continue its involvement after it goes on stream.

The Chembur plant has a capacity to produce 20,000 tonnes of LDPE. Naphtha, the feedstock, will be piped from Hindustan Petrochemical's refinery in the neighbourhood. Manufacture of alcohol-based chemicals (acetic acid, butanol, butyl acetate and ethyl acetate with a combined capacity of 12,500 tonnes) will begin in June. The Chembur plant has the only facility in India

to produce XLPE (cross linked polyethylene) resin, a high value item used by the cable industry. XLPE costs about Rs. 50 a kg. compared to Rs. 30 for general purpose LDPE. The company may eventually step up XLPE capacity from the current 1000 tonnes to 3000 tonnes.

The current consumption of LDPE and LLDPE is placed around 1.5 lakh tonnes, the only producer for the past few years being IPCL which has 80,000 tpa capacity at Baroda. Imports are canalised through IPCL which sells the material at a pooled price of Rs. 30,500 a tonne. Last year, it imported around 40,000 tonnes of LDPE and LLDPE. IPCL is also implementing another 80,000 tpa unit in Nagothane in Maharashtra, which is to go on stream in 1990.

IPCL has received permission to increase the ethylene capacity of its Baroda cracker from 1.30 lakh tonnes to 3 lakh tonnes. Unconfirmed reports say that another 80,000 tonnes per annum plant is proposed in Baroda based on the enhanced ethylene capacity.

IPCL's proposal to scrap its existing polypropylene plant in Baroda based on outdated technology and set up a new state-of-the-art 60,000 tpa plant has also been approved, according to industry sources in Bombay.

Prompted perhaps by the prospect of losing its status as a monopoly supplier, IPCL has now begun informing customers in advance about June/July arrivals. Imports are now coming almost exclusively from Brazil and East European countries who are badly in need of hard currency.

West European giants like Hoechst have priced themselves out of the market. LDPE is now ruling around \$1,000 a tonne, but the falling rupee value has more or less offset the advantage of the softening price.

KALPAKKAM FBTR REACTIVATED

Irradiation of the uranium plutonium carbide fuel has resumed at the Indira Gandhi Centre for Atomic Research Kalpakkam with the fast breeder test reactor (FBTR) being made critical again after being shut down two years ago following a fuel handling mishap.

The reactor is the first in the world to use the uranium plutonium carbide fuel. Experiments to test the validity of the fuel could take three years as involved fabrication of the fuel, irradiation and reprocessing of the spent fuel to recover plutonium, atomic scientists said.

The reactor was made critical on May 11, with 22 fuel sub-assemblies and the 23rd sub-assembly to be loaded on to the reactor either on May 15, or 16.

The damaged fuel had been removed with remote controlled tools. The reactor would be connected to the steam circuit in the next three months.

The neutron source position has now been shifted to the centre of the reactor from the side as suggested by the safety review committee.

Major experiment in the next few months would be the natural convection experiment in which the reactor would be allowed to shut down automatically through natural convection, scientists explained.

The FBTR, commissioned in 1985, is the first of the country's second generation nuclear reactors.

Scientists explained that its shut down did not significantly affect the country's long-term fast breeder reactor programme and the detailed project report for the 500 mw prototype fast breeder reactor would be submitted to the Government in a month.

FERTILISER

Strategy for 8th Plan being finalised

A three-tier fertiliser strategy consisting of indigenous production, buy-backs from joint ventures in the Gulf countries and marginal imports from international markets is being finalised for the Eighth Five-Year Plan (1990-95).

This is a sequel to the planners' preference for utilising the natural gas resource as a priority feedstock for electricity generation to overcome the chronic power shortage situation. So far the fertiliser sector had enjoyed the priority for using gas as feedstock.

The new fertiliser strategy will be spelt out in the forthcoming approach paper to the Eighth Plan. It is being finalised on the basis of the reports of the various working groups assigned to go into specific areas.

Accordingly, no new gas-based fertiliser plants will come up during the next plan period, except the three remaining ones (Godapan, Babrala and Ghajahanpur) on the HBJ pipeline as

their implementation was held up for various reasons.

However, the profit making Indian fertiliser units in the public, cooperative and private sectors would be permitted by the government to set up joint venture plants in the Gulf countries with equity participation and long-term buy-back deals. This is also expected to help the Indian fertiliser plant manufacturing and erecting companies to get international experience.

The planners point out regular but limited imports of fertilisers would be part of the strategy to bridge the gap between rising fertiliser demand and supply (from the indigenous and Gulf units). They said that the provision for market imports would avoid the burden of huge carry over fertiliser stocks in a year the monsoon is not favourable.

The demand for fertilisers at the end of the Seventh Plan in March 1990 is projected to be 9.1 million tonnes of

nitrogenous and three million tonnes of phosphatic plant nutrients. By the end of the Sixth Plan consumption figures were only 5.4 million tonnes nitrogenous and 1.8 million tonnes of phosphatic fertilisers.

It is pointed out that the rising demand for fertilisers would outstrip the envisaged Seventh Plan fertiliser manufacturing capacity build up of 9.2 million tonnes of nitrogenous and 2.8 million tonnes of phosphatic fertilisers. This naturally calls for sanctioning more new units to come up in the Eighth Plan.

However, as the planners have decided to earmark natural gas for power generation even setting up second streams on the HBJ pipeline units is not favoured. Use of other feedstocks like naphtha and fuel oil for fertiliser manufacture is not preferred by the government and the companies because of the uncertainties in its availability. It is in this context that the planners considered the original proposal by some non-resident Indian entrepreneurs to set up units in the Gulf.

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Execution of fertiliser projects: Plan Panel moots role for Indian consultancy firms

Indian consultancy firms have the required resources and expertise to be given the role of prime contractors in the execution of fertiliser projects during the Eighth Plan. Such a role has not so far been assigned to these firms despite having gained the necessary experience and capabilities. A sub-group of the working group on fertilisers, set up by the Planning Commission to chalk out the strategy for the Eighth Plan, has recommended that project owners should be free to select the Indian consultants on the basis of competitive merit.

It says that apart from the jobs in India, Indian consultancy firms should obtain jobs in developing and developed countries. India has the necessary talent and experience to undertake such jobs. In order to enable the Indian consultancy firms to acquire a leading position in the field of fertiliser project execution both in India and abroad, it is nec-

essary that opportunities are first provided to these firms to execute projects in India as prime contractors and thereby developing into consultancy organisations of international repute.

A step in this direction will not only give due recognition to the expertise and resources developed over the years, but also will provide these firms with the much needed credentials for securing jobs abroad. For this, the sub-group says, Indian consultants should be assigned the role of prime contractor for the future projects.

For the future projects, only Indian consultants should be authorised to import technology after adequate evaluation in line with the government policy.

This, in turn, would mean that promoters of the project should not be allowed to import technology directly and enter into licence and engineering agreements with overseas firms, as is

practised now in recent projects. Under the prime contractorship, Indian consultancy firms should take the entire responsibility of project execution including demonstration of performance guarantees and associated liquidated damages.

For this, Indian consultants, wherever considered necessary, should enter into appropriate tie-up arrangements for process licence and basic process design to the minimum extent required.

The extent of foreign association should be limited to the minimum requirement of basic design and the extent of expatriate association in construction and commissioning also should be kept minimum.

Indian consultants should import only technology components like converter basket know-how, carbon-dioxide removal process and PSA units, and not the total process engineering package. The same need not apply to new concept technology, where import of complete basic design may be required for the first plant.

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Panel on import of phosphoric acid recast

The negotiating committee for import of phosphoric acid has been reconstituted. Three key members of the committee have been replaced.

Mr. R.K. Anand, a joint secretary in the department of fertilisers, has been replaced by another joint secretary, Mr. B.K. Saha. Mr. N.B. Chandran, chairman-cum-managing director of the fertilisers and Chemicals Travancore Limited (FACT), has been replaced by Mr. P.N. Arunachalam, managing director of Pradeep Phosphates Limited (PPL), and a representative of Zuari Agro Chemicals has replaced a representative of SPIC. The Indian Farmers and Fertilisers Co-operative (IFFCO), however, continues to be authorised to invite tenders for the import of phosphoric acid.

Industry sources expressed surprise over the reconstitution of the committee despite the government itself, having failed to take a decision on its recommendations which were submitted to the minister of state for fertilisers, Mr. R. Prabhu, in December last.

The committee had negotiated with the suppliers for import of phosphoric acid on the basis of the tenders invited by IFFCO. After prolonged negotiations, it had recommended a price of Rs. 480 for a tonne of P_2O_5 (CF). The committee's recommendations were sent to Mr. Prabhu and since then the file has not been returned to officials for necessary action.

The sources say that if the price fixed by the committee was not acceptable to the higher-ups, they should have communicated it to the committee and should have asked for inviting the tenders once all over again. Instead of doing this, the government reconstituted the committee itself. No orders have been given to the new committee, too, for phosphoric acid imports.

Phosphoric acid shipments had come to a standstill in January following the government's failure to take a decision on its price. This had resulted in the gradual closure of units making phos-

phatic fertilisers. The price for imported phosphoric acid is negotiated every six months for shipments during January-June and July-December periods under the aegis of the negotiating committee for the import of phosphoric acid. This price is finally approved by the government. Around 16 lakh tonnes of phosphoric acid is imported every year for use by fertiliser units.

RCF SIGNS MoU WITH MINISTRY

The Department of Fertilisers has signed a memorandum of understanding (MoU) with the Rashtriya Chemicals and Fertilisers (RCF), an undertaking under its charge, for 1989-90. The MoU signed at New Delhi on May 16 is the first being signed with a fertiliser manufacturing concern. It envisages a degree of freedom and flexibility in the relationship between the Govt. and the undertaking to achieve the planned

objectives and at the same time ensuring adequate attention to accountability of the undertaking as an instrument of development. It has been structured in three parts comprising the mission and objectives of the company, performance evaluation criteria and target and the necessary delegation of powers and assistance from the Government.

Targets have been fixed for production, production efficiencies, sales and financial return etc. Qualitative dynamic factors such as customer service and customer satisfaction have also been included. Special features such as pollution control measures and welfare of the farming community have also been provided for. The evaluation and review of the performance will be done annually by the government. A mid-term appraisal of the MoU will also be done by the high-powered committee headed by the Cabinet Secretary. Particular stress has been laid on conservation of energy and improvement in energy conservation level besides R & D activities, training and job enrichment and diversification.

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J.B. Chemicals plan glass bottle unit

J.B. Chemicals and Pharmaceuticals Ltd. a leading Indian drug company, is diversifying into hollow glass manufacturing in a big way. The company is planning to set up a Rs. 12 crore plant for the manufacture of glass bottles required by the pharmaceuticals industry.

The plant is to be located in Gujarat. The project is expected to go on stream in two years. According to Mr. B.J. Mody, chairman of the company, the plant will have a production capacity of 18,000 tonnes per annum. And a large part of this production will be required for captive consumption.

J.B. Chemicals and Pharmaceuticals alone requires 25 million bottles every year for packing its products, and the company is currently facing the problem of non-availability of glass bottles because of a general shortage in the country.

The demand for glass bottles continues to grow in the pharmaceutical industry at the rate of 25 per cent a year as plastic bottles cannot be used for many of the drug preparations. Cost-wise also plastic bottles are not attractive enough to the drug industry.

The company expects to record a substantial rise in the turnover and profitability, with the commissioning of the bottles manufacturing plant. The turnover of the company has been growing at the rate of 25 per cent since 1985 when the company went public.

The turnover of the company in the current year ending June 1989 is expected to be Rs. 38.5 crores. The company had achieved a sales turnover of Rs. 32.3 crores in the last year ended June 1988.

The joint venture project of J.B. Chemicals and Pharmaceuticals in Nigeria, which commenced production in early 1986, has started making pro-

fits. This unit is mainly manufacturing formulations of advanced antibiotics, vitamins and metronidazole.

Nigeria is one of the most potential markets in Africa for drugs and pharmaceuticals. The country imports over Rs. 500 crores worth of drugs and pharmaceuticals every year.

J.B. Chemicals and Pharmaceuticals is the largest manufacturer and exporter of metronidazole, the widely used anti-dysentery drug in the country. The company's turnover from this drug alone is Rs. 7 crores.

The company has a production capacity of 400 tonnes for the drug. An additional capacity of 150 tonnes was added only two years ago.

The company also commissioned a Glyoxal plant with a capacity of 1,200 tonnes last year. Glyoxal is a basic raw material for the manufacture of metronidazole.

Mr. Mody says that three ayurvedic preparations for common ailments will be launched shortly. These products are being test-marketed currently. The main advantage for the company in introducing these products is that ayurvedic preparations are outside the purview of price control.

IDMA, OPPI PLEA TO SCRAP TURNOVER TAX

The Indian Drugs Manufacturers' Association (IDMA) and the Organisation of Pharmaceutical Producers of India (OPPI) have jointly pleaded with the Government to scrap the turnover tax on the industry.

Several State Governments, including Maharashtra are levying turnover tax and additional surcharge on sales tax, both of which cannot be passed on to the consumer. The tax burden ranges

from 0.5 per cent to 2 per cent. Maharashtra levies a turnover tax of 1.25 per cent and 0.48 per cent additional surcharge on sales tax.

While other industries can recover such levies from the consumer, the same is not possible for the pharmaceutical industry whose prices are controlled by the Government.

The Bureau of Industrial Costs and Prices which fixes the prices of bulk drugs and formulations does not make any provision to enable the industry absorb additional costs like turnover tax.

As a result, mark up allowed to the industry gets eroded by these levies. The profitability of the industry, which is around four per cent, is being eroded further by such levies, the industry has told the Government.

To compensate for any revenue loss to the Government on account of withdrawal of turnover tax and additional surcharge, the Government may resort to increasing the sales tax rate, the industry has suggested.

RPL TO PAY 15% MAIDEN

Reliance Petrochemicals Ltd. (RPL) has recommended a maiden dividend of 15 per cent on pro-rata basis for the first accounting period ended March 1989. The total dividend outgo is Rs. 4.54 crores.

According to the press release, substantial progress has been made with regard to projects under Phase-I, namely those for the manufacture of MEG, HDPE and PVC and they are expected to be commissioned as per schedule, by the end of 1990.

The company has earned a gross profit of Rs. 6.81 crores on a turnover of Rs. 26.64 crores. The net profit is Rs. 5.02 crores after depreciation of Rs. 0.85 crores and taxation of Rs. 0.94 crores.



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Bihar's bulk drugs project may be delayed further

The move of the Bihar government to expedite commissioning of the bulk drugs and formulations project through a private partner has run into rough weather. Launched at Hajipur, across the Ganga, with much fanfare, the project is likely to be delayed further, says a report in the Economic Times.

According to industry sources, offers for partnership were invited a few months back in response to which 11 firms, located in different parts of the country, had applied. In addition, direct contacts were made with reputed pharmaceutical companies including Indian Drugs and Pharmaceuticals Ltd. (IDPL).

Out of these 21 companies, most had shown interest only in marketing tie-up. A few others had visited the project site and started negotiations. However, excepting one, a Ranchi firm, all had backed out sooner or later. Now even this firm has shown disinterest, the sources said.

The main reason why none of the companies is entering into an agreement for running the unit in the joint sector is that there has been much cost overruns and it is not found viable at this "huge cost". The cost of the project which envisaged production of analgin as the bulk drug has been jacked up to about Rs. 6 crores from the revised cost of Rs. 4.47 crores last year.

It was also believed by some of the companies, showing interest that the assets of the projects had no match with investment recorded in the project. As a result, the Ranchi firm which had evinced keener interest demanded that a valuer be appointed and the equity share of the private party revised in the light of the valuer's report.

This company, the sources said, had agreed to sign agreement for the project on the condition that it was asked to pay

only Rs. 30 lakhs as its equity share, pending the valuer's inspection, as against Rs. 70 lakhs (25 per cent) required for participation as per the standard government norm for participation in any project.

The government dilly-dallied for agreeing to appointing a valuer might have opened a floodgate of demands for similar facility in other projects, where participation was invited. It is an open secret that the assets of many government launched projects had been less than the investment shown and costs have gone high on account of inefficiency and lack of managerial skill.

The industry sources claimed that the delay in commissioning of government project had been a rule rather than an exception in the state. The basic drugs and formulations projects in question were conceived as early as 1983 and term loan was sanctioned in 1984. The project was originally scheduled to be commissioned in March, 1986, but much work remains to be done yet. The fate of the project hangs in the balance now in the wake of the withdrawal of the latest offer.

A government spokesman, however, claimed that 85 per cent of the work had been completed and that the project would be commissioned "shortly".

SANDOZ INDIA

Sandoz India has stepped up the dividend by two points to 18 per cent for 1988, absorbing Rs. 95 lakhs against Rs. 74 lakhs in 1987. The gross income amounted to Rs. 133.5 crores in 1988 against Rs. 102.68 crores. Export sales totalled Rs. 17.34 crores against Rs. 12.42 crores.

The profit before tax amounted to Rs. 3.77 crores against Rs. 1.76 crores. The profit for 1988 include an amount

of Rs. 1.55 crores accounted for accrual basis in accordance with change in the Company Law. With this change, the amount would have been accounted for only in 1989.

The company's new plant at Parbhani commenced commercial production in the first quarter of 1988. This had impact on depreciation. The aggregate depreciation amounted to Rs. 5.8 crores against Rs. 2.72 crores in 1987.

Production and sales mainly improved in the second half of the year. In spite of the new DPCO, it has not been possible to breakeven in the pharmaceutical domestic market. Also, not all increase in costs could be matched by productive gains and price increases due to market conditions. The cash flow amounted to Rs. 8.3 crores before dividend against Rs. 4.3 crores.

After providing Rs. 1.70 crores for taxation (Rs. 20 lakhs in 1987) and after making adjustments in respect of previous years, the profit available for appropriation amounted to Rs. 2.44 crores against Rs. 1.63 crores in 1987. An amount of Rs. 1.49 crores (Rs. 88 lakhs) is proposed to be transferred to the reserves.

STUDY ON NALCO EXPANSION SOON

The Government will soon commission a detailed feasibility study for the expansion of National Aluminium Company (NALCO) complex in Orissa. NALCO has proposed to increase its metal production capacity to 330,000 tonnes with three additional units of 120 mw each of captive power plant.

It has also proposed to set up semi-fabrication facilities with a capacity of 40,000 tonnes per annum. At present, NALCO has the capacity to produce 218,000 tonnes of aluminium, 800 tonnes of alumina, 2.4 million tonnes of bauxite and to generate 600 mw of power.

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IMPORTED NATURAL RUBBER

STC hikes price by steep margin

The State Trading Corporation (STC) has jacked up the release price of imported natural rubber (RSS-3 grade) to Rs. 23,573 per tonne from Rs. 20,000 ex-Madras. In Bombay the release price will be Rs. 25,118 per tonne which with octroi and sales tax comes to Rs. 26,000.

The STC last revised the price of the imported rubber in September 1988 when the new price was fixed at Rs. 20,000. In August, 1988 STC increased the release price to Rs. 19,000 from Rs. 17,000 and a month later to Rs. 20,000.

Informed sources in Bombay say that the sharp hike in the release price is despite a drop in the rubber prices in the Malaysian market. The price for this grade is said to have fallen to Rs. 16,000 per tonne which was around Rs. 17,000 a few months ago.

With the STC's decision to raise the release price, there has been a steady upward trend in the prices of natural rubber in the local market. The price of RMA-4 grade a comparable grade to RSS-3, has shot upto Rs. 20,450 per tonne in the local market. The price of this grade was only Rs. 18,800 a fortnight ago.

The sources point out that the upswing in the rubber prices in the local market is likely to continue further unless the government intervenes in the market.

The rubber goods industry is shocked by the STC's price hike. All India Rubber Industries' Association has already represented to the Prime Minister and the commerce minister against this unjustified price hike.

The association has urged the government to totally waive the import duty on natural rubber to offset the increase in the international price. The current import duty on natural rubber is 25%. In fact the import duty was brought down to 25% last year from 35%.

The present higher level of natural rubber price would virtually make the

operations of thousands of small rubber goods manufacturing units and tyre companies unviable. Many of them would therefore have no option but to close down their shops ultimately.

The association is of the view that STC is charging a huge margin on the actual cost of imported rubber. The service charge of STC on a tonne of imported rubber is stated to be over Rs. 2,500.

The association has also pointed out that STC had failed to efficiently handle the import of rubber and has added much to the cost of distribution.

Meanwhile, the industry has estimated a demand of 3,43,000 tonnes of natural rubber for 1989-90. Against this expected production of natural rubber in the country is only 2,73,000 tonnes. The deficit of natural rubber taking into consideration the stock requirements of the industry is placed at 91,000 tonnes during 1989-90.

RUBBER INDUSTRY PLEADS FOR DUTY RELIEF

Every time the State Trading Corporation steps up its release price of imported natural rubber, the price of the indigenous natural rubber too goes up. This tendency has pushed the industry, which consumes around 3.43 lakh tonnes of it, into a state of crisis.

Simultaneously, the user industry has been lamenting that the STC buys the local natural rubber from the market and offers that too at prices on par with the imported rubber. The All India Rubber Industries Association has expressed its regret that the Government has allowed the STC to so conduct itself.

The association, worried at this fall-out, has said that the "interference with price and availability" has been "jeopardising" the industry interests and accused the Govt. of allowing this "punitive treatment" to continue, instead of asking the STC to change its ways.

Suggesting that the STC has failed to "efficiently handle import of rubber and

added much to cost of distribution encouraged local prices to go up" the association has sought that the industry be allowed to directly import upto a % of its consumption, that being a normal deficit. It has said that import during peak rubber production period is not permitted.

EQUALITY SOUGHT IN ENVIRONMENT MEASURES

India on May 15 urged advanced nations to tackle the problems of global environment with a vision that transcends political boundaries. Addressing the meeting of the governing council of the United Nations Environment Programme (UNEP) at Nairobi, the Environment and Forests Minister, Mr. Z. Ansari, said developing countries would accept no solution to the problem which denied equity between countries.

"Any solution has to be equitable between nations, the causes need to be tackled individually with sustainable development getting priority of all nations", he said. Mr. Ansari said regulatory measures to be effective need to be applied only to the major polluters identified according to scientific criteria and the others & need supportive measures.

Nations strong in technology and resources need to use them to check global environmental degradation without bias, he added. Mr. Ansari said the world community had been discussing global environmental issues for the last 20 years in a spirit of co-operation. "It is now time to be more specific about solutions implementable by all countries." Global environmental problem had arisen primarily from two causes. The first was the pollution created by industrialisation and accompanying life styles. The second was the struggle for existence of a vast majority of humanity which by itself led to over exploitation of natural resources. India, Mr. Ansari said, had already launched various steps to control pollution, though much still remained to be done in technical and financial terms and a combination of regulatory and supportive measures

A rapid wrap-up of what's new in Operations, Processes and Products

Asymmetric catalysis in organic synthesis with industrial perspectives

H.B. Kagan has given a state-of-the-art-review of this subject. The preparation of enantiomerically pure compound can be through resolution of a racemic mixture or through asymmetric synthesis (a.s.). A.S. makes possible the preparation of a pure enantiomers from a prochiral starting material under the influence of a chiral auxiliary which is temporarily connected to the prochiral compound or is part of a reagent or a catalyst. The amount of catalyst can be as low as 0.01 to 1% mol. aq. AS may be through organometallic species (OMS), organic compounds or biochemical. AS by OMS has now matured in the area of hydrogenation and (S)-Dopa has been prepared. Anic has recently used pnp for (S)-phenylalanine required for Aspartam. (E)-Geraniol has been reduced to (R)-citronellol.

Asymmetric hydroformylation has been possible and aryl-propionic acid can be a good target. In the case of styrene ee upto 80% has been realised. In the presence of triethyl orthoformate 100% ee of the acetal has been realised. Asymmetric cyclopropanation has also been realised. Sharpless' asymmetric epoxidation is now well known (Asymmetric PTC has been referred in this column) (*Bull.Soc.Chim.Fr.*, 1988, No 5, 846-853).

FINE CHEMICALS

Temocillin (T)- From Discovery to Production

Dr. Clayton (of Beecham Phar.,U.K.) has given a very useful account of this versatile modified penicillin. A number of alternatives for the production of T from 6APA were considered. Thus, in initial steps, 6APA can be converted to its benzyl ester, and isolated as its p-toluene sulphate, via enamine protection of the amino junction and esterification. At a later stage it was found prudent to convert one of the antibiotic Ticarcillin to T via reaction at -75°C in a solution of DMF and methanol followed by the sequential addition of sodium methoxide and t-butylhypochlorite. A key intermediate is thien-3-yl malonic acid (TMA). 3-substituted thiophene is required. Thus 3-methyl thiophene can be subjected to allylic bromide which without isolation is reacted with NaCN, using a PTC. Reaction of nitrile with diethyl carbonate in the presence of sodium ethoxide generated the

nitrile ester which can be hydrolysed to the desired malonic acid. Routes for TMA, independent of thiophene, have been developed e.g. via acetylene, chloroacetyl chloride; reaction of thioacetaldehyde and acrolein. (*Chem. Ind.* 1989, 6 March, 124-134)

Scale-up of the synthesis of ICI 118551

J. Hutton (of ICI) has given a very interesting account of the scale-up from bench scale to pilot scale and problems that were encountered. This β -blocker is based on toncarine, a perfumery chemical, as the starting material. The problems associated right from the stage of hydrogenation to a later stage for the reaction of the phenolic OH with trans + cis crotyl chloride are discussed with some honest statements. There are statements like "Don't always expect an improvement when you purify an intermediate". There is always an interest in "telescoping" three stages into one. Crotyl chloride comes as a mixture of isomers. Epoxidation with H_2O_2 PhCN/ $KHCO_3$ was found to be good. Runaway conditions were also encountered in some steps. (*Chem.Ind.* 1989, 6 March, 134-140).

SEPARATION PROCESSES

Membrane Based Separations

Gas Separation Membranes (GSM)

R.W. Spillman has given an exhaustive account of this "young" method of separation which is barely ten years old. Membranes are thin barriers that allow preferential passage of certain substances; GSM include cellulosic derivatives, polysulphone, polyamide and polyimides. GSM can be as flat sheets or hollow fibres; flat sheets are typically packaged into "spiral-wound". Most membranes are non-porous and work through differences in solubility and diffusion. A number of separations like CO_2/H_2S removal, hydrogen separation, hydrocarbon removal, oxygen enrichment, etc. are now commercial.

Various aspects of process design are discussed in this paper and this includes merits of single stage vs multi-stage operation. The strategy of combining membrane separations with either PSA or cryogenic has also been considered. Cost data are also provided. A new emerging application is gas drying. New developments will

be based on "selectivity, permeability and durability". (*Chem. Eng. Prog.*, 1989, Jan., p.41-62)

New vistas for membrane technology

A.S. Michaels has given a very useful account of this subject which includes reverse osmosis (RO), microfiltration (MF), ultrafiltration (UF), gas separation, dialysis, electrodialysis. It is expected that by 1990 the market will reach more than \$6 billion; gas separation will expand eight times and electrochemical cells five fold.

The coming years will witness: discovery and development of novel membrane materials and structures for separation; development of integrated separation processes; discovery and development of processes or devices that use membranes as active participants in a chemical or physical transformation. Formed-in-place or "dynamic" UF membranes produced by deposition of inorganic (e.g. zirconia) or organic (e.g. ovalbumin) hydrogels on a porous support resist fouling. Asymmetric ceramic laminate UF membrane is under development which will be stable and refractory.

The discovery that extremely - rigid - backbone polymers such as substituted polyacetylenes, display anomalously high gas permeabilities and molecular size selectivities has stimulated worldwide research in this area. Pervaporation is attracting attention. Ultramicroporous inorganic glasses and crystalline solids are being reexamined as candidates for small-molecule permselective membranes.

Zeolites in membranes are also being evaluated and the prospect of incorporating the unique sorption - diffusion selectivity of porous crystalline zeolites into an ultrathin, high permeability superselective membrane is tantalizing.

Membrane solvent extraction is now attracting attention and here separation of two-phases with a semi porous membrane is realised. Because hollow-fiber membranes can handle suspended solid particles on the lumen side, the process is particularly attractive for continuous extraction of whole fermentation broths or tissue culture media.

Protein separation by affinity complexation and UF is attracting a lot of attention, Biosensors are being developed.

Electrochemical separations and transformations merit

further attention as these can bestow many benefits including high thermodynamic efficiency. (*Chemtech* 1989, March, p. 162-172).

HIGEE: A STATUS REPORT

T. Fowler has given an account of the industrial exploitation of Hige contactor which offers an unusually low contact time and hence high values of liquid side mass transfer coefficient in gas-liquid contactors. The reticulated packing provides a large specific surface area of 2,500 m²/m³ with voidage exceeding 90%. Hige is particularly useful in off-shore and shipmounted applications. Water treatment via the removal of volatile organic substances through stripping has been industrially practiced. Natural gas treatment for acid gas removal as well as for dehydration continues to attract attention. (*Chem. Engineer* 1989, No.456, Jan. p.35-37).

SEPARATION OF HF FROM AQUEOUS SOLUTIONS CONTAINING HF + NH₄F

It is possible to extract HF selectively with tricaprylamine (Alamine 336), dissolved in kerosene; HF can be recovered by boiling the organic phase.

Similarly tricaprylamine hydrochloride, dissolved in kerosene, can be used to treat aq. solution of NH₄F to recover HF (*E.P.* 286, 450 & 286, 449 of Oct.1988, *Cf. Chem. Abstr.*, 1989, 110, 117654 & 117655).

PROPYLENE GLYCOL TERT BUTYL ETHER (PGTBE)

Maruzen Petrochem (of Japan) has claimed that isobutylene can be reacted with propylene glycol, in the presence of strongly acidic cation exchanger resin to give PGTBE. tert Butanol is used to prevent dimerization of isobutylene (*Chem. Abstr.*, 1989, 110, 114304).

ALKYLATION OF PHENOL WITH STYRENE

It has been claimed by Kawasaki Steel Corp., Japan, that Nafion 117, at 100°C, catalyses the reaction of phenol with styrene to give 45% o and 52% para alkylated product (*Chem. Abstr.*, 1989, 110, 114441).

GAMMAHYDROXYBUTYRIC ACID (GHBA)

Nissan has claimed that maleic anhydride can be hydrogenated, with 5% Pd/C catalyst at 75°C and 75 atm, in AcOEt medium, to give GHBA in 90% yield. (*Chem. Abstr.*, 1989, 110 114310).

PTC AS ACTIVATORS IN SULFUR VULCANIZATION

EG, dibenzo-18-crown-6 and $\text{Ca}(\text{OH})_2$ have been used as activators in S-vulcanization of some rubbers for the manufacture of conveyer belts, calendered plates and radioengineering parts in USSR. (*Chem. Abstr.*, 1989, 110, 116376).

Nylon 12/12

Du Pont is going ahead with scale-up of this versatile material, which is resistant to chemicals and hydrolysis and is also flexible at low temperature, based on the reaction of 1,12 dodecane-dioic acid and 1,12-dodecane diamine. (*ECN*, 1989, 27 March, p.19).

Rare metals from waste dust.

It has been found that the fine dust collected from the electrostatic precipitator of power stations based on coal gets enriched with respect to metals, possibly due to their volatilisation; a similar situation exists in pyrometallurgical operations. Ga, Y, Sc can be found besides Zn and Pb; in ferrochrome production Zn is in high amounts (66000ppm) and Ga can be at a level of 1500 ppm. A selective chlorination has been considered. (*Process Eng.*, 1988, Dec., p.21).

REMOVAL OF SUB-MICRON PARTICLES IN SCRUBBERS

Venturi scrubbers are commonly used but exhibit high pressure drop. In a new design of the spray nozzle the size and distribution of droplets is precisely controlled. (*Process Eng.*, 1988, Dec., p.23).

A NEW SYNTHESIS OF CARBOXYLIC AND CARBONIC ACID ANHYDRIDES USING PTC

Aryl chlorides and alkylchloroformates react smoothly with one molar equivalent of NaOH, in a liquid-liquid system with PTC, to give high yields of the corresponding symmetrical carboxylic and carbonic hemiester anhydrides. Even unstable anhydrides like 4-nitrobenzoic, 2 furoic, methacrylic anhydrides can also be made. Tetrabutylammonium chloride seems to be a good PTC (*Tetrahedron*, 1988, 44, 2471).

NEW PROCESSES

ISOPHORONE DIISOCYANATES (IPDIC)

Daicel (Japan) have claimed that the IP diamine car-

bamate (methyl) esters can be thermally cracked at 290°C to give IPDIC (*Chem. Abstr.*, 1989, 110, 57181).

DIMETHYL ACETAMIDE (DMA)

Mitsubishi has claimed that Y zeolite catalyses the reaction between CH_3CN and methanol at 334°C to give DMA, along with methylacetamide (*Chem. Abstr.*, 1989, 110, 774838).

CONTINUOUS PROCESSES FOR (HIGHER) 1,2 DIOLS

Degussa has claimed that C8-C30 aliphatic, linear or branched epoxides or higher mol. wt. cycloaliphatic epoxides react with water and acidic catalysts at a pressure of 1-5 atm. to give the corresponding diols. These diols are useful in cosmetic and pharmaceutical industry (*Chem. Abstr.*, 1989, 110, 945503).

In a related process higher epoxide (e.g. C10 aliphatic epoxide) reacts with H_2S at 74°C, in the presence of a small amount of tetramethyl guanidine, to give 1-mercapto-2-dodecanol (*Chem. Abstr.*, 1989, 110, 94506).

ORTHO ALKYLATION OF AROMATIC AMINES WITH OLEFINS

Air Products (USA) has claimed that Al-cation-exchanged zeolite catalyses the reaction between aniline and propylene at 250°C and 60-70 atm to give N-isopropyl aniline (+ some N-diisopropylaniline) and 4-isopropylaniline + 2,4 diisopropylaniline (*E.P.* 286029, Oct. 1988, *Chem. Abstr.*, 1989, 110, 97558).

VAPOUR PHASE CATALYTIC REDUCTION OF BENZOIC ACID

Stamicarbon (The Netherlands) has claimed a novel process for the reduction of benzoic acid, at 420°C with a Mn-containing catalyst, to give benzaldehyde (*EP* 290096, Nov. 1988, *Chem. Abstr.*, 1989, 110, 97564).

ANIONIC PHASE TRANSFER CATALYSIS (PTC)

Ichikawa, Kobayashi and Sonoda have brought out the utility of tetrakis (3,5-bis (trifluoromethyl) phenyl borate (TFPB), a highly lipophilic fluoroaromatic borate ion which is remarkably stable under acidic and oxidative conditions, as a PT catalyst to transfer cationic species like diazonium and onium ions in reactive form of ion pair from an aqueous or solid phase into a non-polar

phase. Illustrative examples are: diazo coupling; Friedel-Crafts alkylation; nitrosation (*J.Syn. Org.Chem. Japan*, 1988, 4, No.10, 943-954).

HYDROFORMYLATION REACTION FOR MANUFACTURE OF FINE CHEMICALS: USE OF TWO PHASE SYSTEM

RUSSEL (of Johnson Matthey) has given an account of a new water soluble Rh catalyst, which is used at less than 300 ppm, under mild conditions of 10 atm and 100°C. This catalyst has a ligand 4-diphenylphosphinobenzoate and a quaternary ammonium compound like cetyl pyridinium bromide, cetyltrimethyl benzylammonium bromide is used to transfer Rh from aqueous to organic phase.

The reaction rates are remarkably high compared to the trisulphonate derivative of triphenyl phosphine (which is also water soluble and the ratio of n to iso product is exceptionally high (even 100)).(*Platinum Metal Rev.* 1988, 33, p.179).

The Ruhrchemic process using the water soluble triphenyl phosphate trisulphonate is described by Bach et al. (Paper presented at Int. Cat.Congress, Calgary, Canada, 1988, p.254)

2 CHLOROPROPIONOLDEHYDE

MITSUI has claimed that vinyl chloride + CO + H₂ with catalyst based on Rh gives the title compound. (*Plat.Metal Rev.* 1988. 32, p.222)

CYCLODEXTRINS (CO)-AIDED BIOCONVERSIONS AND FERMENTATIONS

The efficiency of such processes is often limited by the inhibitory or toxic influence by substrate or the product. CD solubilize organic compounds and are biocompatible. Thus, microbial transformation of cholesterol to androst-4-ene-3, 17-dione is greatly facilitated by CD - (95% conversion vs only 40% in the absence of CD). CD can be recycled via regeneration with a suitable solvent.(*Trends in Biotech*, 1989, 7, Jan, p.2-4)

SOLVENTS FOR CARBONLESS COPY PAPER (CCP)

The world consumption of paper exceeds 200 mtpa; the demand for office papers is now about 10 mtpa and ccp

is about 1.7 mtpa. The principle of ccp is that the base of the paper is coated with microcapsules with a diameter of 3 to 8 microns and these contain colourless dye precursors (e.g. leuco dyes) which are dissolved in colourless solvents. The ccp paper works on interaction of mechanical and chemical effects.

The common solvents, which have stringent requirements, are diisopropylnaphthalene (2,6 and 2,7 isomers in the ratio of 1:1 is a typical product); phenyl ethyl tetralin; partially hydrogenated terphenyl; chloroparaffins.(*Stadelhofer, ZW and Zellerhoff*, R.B.Chem.Ind. 1989, no.7, 3rd April, p.208).

REACTION BETWEEN DIPHENYLAMINE AND ARYLHALIDES: PEG as PTC

K. SUKATA and T.AKAGAWA have shown that PEG and their dimethyl ethers are good PTC for the reaction under reference in the presence of KOH.(*J.Org.Chem.* 1989, 54, 1476).

EFFECT OF CROWN ETHERS ON ENZYME-CATALYSED REACTION IN ORGANIC SOLVENT

REINHOUT et al have shown that the rate of -chymotrypsin-catalysed transesterification of N-acetyl-L-phenylalanine ethyl ester with n-propanol in n-octane is considerably enhanced by the use of crown ethers. (*J.C.S. Chem.Comm.* 1989, 399).

BUTENE FROM BUTANE

Phillips Pet. Co. has developed STAR (STeam Active Reforming) process for catalytic dehydrogenation of n-butane, isobutane and propane. ROCK and DUNN have given details for 2000, 5000, and 20000 BPSD plant for isobutane and mixed butanes feedstock.

The process operates under positive pressure. In the case of isobutylene from isobutane, molar selectivity is 94.8% at 54% conversion; the corresponding figures for n-butane are 81% at 48.2%.(*Energy Progress*, 1988, 8, 191).

RECOVERY OF BUTENE-1 OR 2

EMMRICH and LACKNER have shown that extractive distillation with a solvent (from morpholine group) can be done to recover pure butene-1 or 2 in the presence of saturates. The process is called Butenex. (*Hydrocarbon Process.*, 1989, Jan., p.71)

ICMA National Conference on Chemical Exports

As a part of its Golden Jubilee Celebrations the Indian Chemical Manufacturers Association (ICMA) had organised a National Conference on Chemical Exports on April 29, 1989 at New Delhi (see Chemical Weekly, May 9, 1989, pg. 40). The Conference was inaugurated by Mr. M.S. Gill, Secretary, Department of Chemicals and Petrochemicals, Government of India. A large number of delegates from the chemical industry participated in the deliberations.

During the conference the following four papers were presented:

1. "Pricing for Export of Petrochemicals", Mr. V.P. Kaushik and Mr. Anand Swaminathan, UB Group.
2. "Speciality Chemicals and Custom Synthesis", Dr. K.H. Gharda, Gharda Chemicals Ltd.
3. "Export Potential for Inorganic Chemicals", Mr. J.L. Thakkar, The Dharamsi Morarji Chemical Co. Ltd.
4. "Export Potential for Dyestuffs & Intermediates", Mr. J.G. Patel, Indian Dyestuffs Inds. Ltd.

Mr. Kishore V. Mariwala, Chairman Western Region, ICMA and Chairman of the Steering Committee for the National Conference welcomed the participants and Mr. Atmaram Saraogi, Vice-President, ICMA, proposed a vote of thanks.

INAUGURAL ADDRESS:

S. M. Datta, President ICMA

"You are probably aware that 1988-89 is the Golden Jubilee year of the Indian Chemical Manufacturers Association. The function today represents the culmination of a series of activities which we have undertaken to celebrate this happy occasion and we have chosen to deliberate upon the prospects of chemical exports from India in view of the increasing importance of improving the balance of our foreign trade. The presence of a significant number of distinguished invitees today gives us a great deal of encouragement. We also owe a special debt of gratitude to the Secretary, Department of Chemicals and Petrochemicals, Mr. M.S. Gill, for taking time off from his busy sche-

dule to deliver the Keynote Address at today's conference.

"During its existence in this country for about a hundred years, Chemical Industry has essentially played a role of import substitution. The seeding and development of markets have usually taken place through the import of finished products and local manufacture has followed, always a few paces behind, in order to reduce the dependence on imports, mostly through Government initiatives. However, the concerted efforts of the two Export Promotion Councils over the last two decades have steadily built up the exports of chemical products from India and, if our current performance is accepted as a guide, the exports could well exceed Rs. 2000 crores during 1988-89. To an extent, the level of exports reflects the robustness of the domestic manufacturing base of the chemical industry. This trend deserves to be welcomed and, indeed, encouraged in view of the significantly high value addition involved in the manufacture of chemicals.

"The pressing need for more intensive exploitation of our fossil fuel reserves promises to open up a steady supply of feedstock for the Petrochemical Industry. Consequently, this sector will spearhead the growth of the Chemical Industry, which is expected to grow at twice the average industrial growth rate. In view of the key role which the petrochemical sector is expected to play in the development of the economy, it is appropriate to plan for exports to supplement the domestic demand in order to build larger, global sized plants so that we can achieve a higher output/capital ratio while planning for growth and diversification. Recent press reports suggest that the Government is actively considering the recommendations of the Mehta Committee in this regard.

"It is important to look at the external environment when planning for



Mr. M.S. Gill, Secretary, Dept. of Chemicals & Petrochemicals, delivering the Key-note address. Others seated from L to R: Mr. O.P. Malhotra, Chairman (ER) - ICMA, Mr. Atmaram Saraogi, Vice President-ICMA, Mr. S.M. Datta, President-ICMA, Mr. K.V. Mariwala, Chairman (WR)-ICMA & Chairman of the Steering Committee for the National Conference and Mr. S.N. Tandan, Chairman (NR)-ICMA.

exports. In the developed economies, there are strong indications of strategic sectoral adjustments in the Chemical Industry as the markets shift from commodity chemicals to the sunrise sectors of chemical specialities and fine chemicals. In Europe, for example, the market share of basic chemicals is expected to drop to only 10% after a decade, while chemical specialities will grow to 26% and fine chemicals to 43% respectively. The ageing of the population in Europe will lead to a rapid growth in the pharmaceutical industry. On the other hand, China has emerged as a major market for basic chemicals as it is now importing over a million tonnes of plastics and resins annually. Similar opportunities on basic chemicals are likely to emerge in other Third World economies as well. Such developing trends are being monitored constantly by countries such as Japan as well as NIC's like Singapore, Korea and Taiwan. Therefore, unless the future directions of development for the Chemical Industry here take such factors into account, it will become increasingly difficult to stumble upon export opportunities as adjuncts to our domestic plans. The ICMA would recommend a structured consultative approach between Government and the Chemical Industry to deal with such issues.

"At first sight, the Chemical Industry appears to be a mere assemblage of a number of distinct and disparate elements. The strongly inter-woven linkages between these elements becomes clear only at the time of shortages. It is no secret that despite the best intentions of all concerned, the output of the Chemical Industry, whether meant for the domestic markets or for exports, has been severely affected by cyclical shortages of basic raw materials and intermediates. Even today, we are experiencing acute shortages of ethylene oxide, aniline, toluene, sulphuric acid and phosphoric acid. These interlinkages must be understood and steps taken to create adequate and diversified manufacturing capacity to avoid shortages. A similar, and equally vital, issue

concerns the pricing of feedstocks. The irrationality of the artificially high pricing of feedstocks has been raised several times by the ICMA and the government has recently responded by rationalising the issue price of feedstock for export manufacturers. We hope that a similar view would be taken about the domestic market also in the not too distant future.

"The Department of Chemicals is destined to play a key role in the Eighth Five Year Plan and we believe that we shall all benefit tremendously from listening to the views which the Secretary will undoubtedly express. I have great pleasure in requesting Mr. M.S. Gill to inaugurate the Conference and to deliver the Keynote Address".

CHEMICAL EXPORTS - PROBLEMS AND PROSPECTS

Key-Note Address: Shri. M.S. Gill, Secretary, Department of Chemicals and Petrochemicals.

"The chemical industry has shown tremendous growth in the 7th Plan during the last four years. This progress actually started in the mid 70's and has continued with an accelerating pace. This is shown by the fact that currently the chemical industry's share in the nation's gross industrial output is about 40% as compared to 8% in 1970-71. As against a general industrial growth rate of 9.1% in the organised sector during the last financial year, the chemical industry's growth rate was 12.8%. The country is becoming self-sufficient in almost all major heavy chemicals and imports of large quantities in products like Methanol, Phenol, Caustic Soda, and Soda Ash have completely disappeared. In fact, we have become net exporters in most of these chemicals which were being imported in large quantities till two-three years ago.

"As you are well aware, there has been a tremendous growth in exports of chemicals and allied products, especially in the last two years. Although

final figures have not been received, it is estimated that in the last one year alone exports of product range handled by Basic Chemicals, Pharmaceuticals and Cosmetics Export Promotion Council commonly known as CHEXIL, would go up from Rs. 783 crores in 1987-88 to about Rs. 1,250 crores in 1988-89. In different sectors of the chemical industry, a remarkable growth has been shown in basic drugs and formulations, dyes and intermediates and in agro-chemicals. In pharmaceuticals we may touch a figure of Rs. 400 crores in 1988-89 compared to Rs. 228 crores in 1987-88. In the dyes and intermediates also it will be about Rs. 400 crores against only Rs. 214 crores in 1987-88. In the total range of chemical products coming under the purview of the Export Promotion Councils, we are likely to cross the figure of Rs. 2,000 crores as against a target of Rs. 1,900 crores. This will be against Rs. 1,280 crores of last year, showing a very impressive growth of 60% compared to the overall expected growth in exports at about 27%.

"As you all are aware, there have been certain problems in exporting larger quantities of chemical products during the last financial year and the Department has been closely associated with all of you in resolving them. The main problem has been the shortage of certain key raw materials based on Benzene, Toluene and concentrated Nitric Acid. The shortage of Benzene occurred rather unexpectedly during the middle of last year on account of a series of technical problems at the level of oil refineries. Part of the shortage was also due to the demand generated by LAI and a general boom in production and exports of all chemicals. However, we have continuously monitored the position and imported about 20,000 tonnes of Benzene for domestic consumption and exports. Imports of concentrated Nitric Acid could not be made on account of technical problems of this product, but we continuously monitored the production of RCF and enhanced allocation

exporters. A number of products in the category of nitro and chloro benzenes manufactured by our public sector undertaking, Hindustan Organic Chemicals Ltd. were also in short supply partly because of shortage of Benzene and CNA and partly because of limitations of installed capacity which could not be increased over-night. However, their production was also closely monitored and availability was considerably enhanced, especially for exporters.

"In this context I would like to highlight some other initiatives that we have taken to help the exporters. There has been a long standing demand that raw materials to chemical exporters should be supplied at international prices. As naphtha is the starting feedstock for a number of chemicals, we held a series of meetings and finally persuaded the Ministry of Petroleum that naphtha should be available to the units making intermediates for export production at international prices. This scheme is now under implementation and oil refineries are making sales of naphtha to a number of units at international prices. This will result in corresponding reductions in the prices of a large number of intermediates which will be used in export production. We have also asked all major public sector undertakings to reserve 5% of their production of key intermediates for exporters. This has already been done by them and the scheme is in operation. However, all private sector undertakings have not responded positively and I would request all your members through the forum of this association that they should also contribute, alongwith public sector units, in reserving adequate quantities of intermediates for exporters and to give them suitable price concessions.

"You are all aware of other initiatives taken by our ministry in improving performance of chemical products and I need not outline them all here. The manufacturers of dyes and intermediates are very happy because their duty drawback was restored from 5 to 10% and this has helped considerably in improv-

ing their exports. Similarly, incentives to deemed exports were enhanced and CCS was approved by the Ministry of Commerce on a number a new products. However, this is a continuing process and we would remain on your side in getting all legitimate concessions and facilities for enhancing performance of exports of chemical products.

"Another success story during last year was in exports of molasses and alcohol. As you know alcohol was in short supply about 3 years ago because of which units of alcohol based industries were working under capacity and new units were not coming up. Thanks to some good years of sugar production, we have considerably increased production of molasses and alcohol and both have become surplus to our requirements during the last two years. Consequently we were able to allow exports of 10 lakh tonnes of molasses and 120 million litres of alcohol during the last financial year.

"Although progress of actual exports was not very satisfactory due to a late start, this is likely to improve considerably during the current financial year. Considering that surpluses are likely to continue, we shall again allow suitable quantities of these two products for exports during the current financial year. However, as manufacturers of chemical products, some of you may be apprehensive about this export policy and may be concerned about the availability of alcohol for chemical industries. I can assure you that quantities will be exported only after fully meeting the requirements of the domestic industry.

"There cannot be a growth in exports unless the production of key chemicals is increased and their availability is ensured both for domestic consumption and exports. We fully realise this aspect and that is why have accelerated the implementation of the liberalisation in industrial licensing policies initiated by the govt. in the last 3-4 years. My Dept. has sincerely implemented policies relating to liberal industrial licensing, broad-banding, minimum economic size

and liberal approval of foreign collaborations. We are paying special attention to product groups which have been facing shortages and which are key to export production. We have, therefore, been quite liberal in additional licensing for products like Acetic Acid, Nitrobenzenes, concentrated Nitric Acid, Sulphuric Acid, Methanol, etc. This gives me considerable hope for improvement in exports of chemical products during the current financial year and I expect that most of the shortages which were faced by exporters in the last 2 years would gradually disappear during the current financial year. Although the same percentage as last year may be difficult on a higher base, we expect a 50% growth this year also, taking exports of all chemical products from Rs. 2000-3000 crores. We have also made ambitious targets for the 8th Plan period and I expect this boom in our chemical exports to continue for the foreseeable future.

"We would like to hear your views on problems and prospects of exports of chemical products and would be happy to keep a continuous dialogue with you on these matters. You are most welcome to bring your problems to us and we shall do our best in resolving them at our level and in coordination with concerned Ministries within the parameters of the broad Govt. policies. At the same time, I also urge upon you to give your highest priority to the area of exports. You are all enlightened businessmen and you know the problems being faced in India in the field of balance of payments. You must rise to the challenge and increase our exports to new heights. Similarly, attention should be paid to reduction of imports and in increasing production in import substitution inds. We shall assist you in this field also.

"I wish all success to your deliberations in today's National Conference on Exports of Chemical products and do hope that you will come up with concrete plans for achieving a high growth in this area in this financial year and 8th Plan. Thank you."

NALCO brand registered on LME

The London Metal Exchange (LME) at its board meeting on May 10 approved National Aluminium's high-grade aluminium ingot for registration as LME brand with effect from May 11.

The registration was granted on the basis of recommendations of the aluminium sub-committee of the LME after reviewing National Aluminium's export performance, the analysis certificate from two assayers on the approved list of the LME and a recommendation letter from two European consumers, including a UK-based company.

The LME registration now puts National Aluminium at par with any reputed western origin for sale of its aluminium metal in any part of the world, says a company release. National Aluminium has received appreciation for its metal from highly quality conscious consumers like Japan, Europe, South Korea and Taiwan.

It has already completed export of over 15,000 tonnes of high-grade aluminium ingots to countries like Japan, Korea, China, Taiwan, UK, Germany and Italy. With the wide acceptance of its metal in terms of quality and delivery schedule, and the latest LME registration, it expects to achieve its metal export target for the current financial year.

The company has established itself as a major exporter of high-grade alumina and during the last financial year, the company earned a total foreign exchange of over Rs. 230 crores, which includes about Rs. 180 crores towards export of alumina, and Rs. 50 crores towards export of aluminium metal.

UNDP AID FOR DRILLING CENTRE

The United Nations Development Programme (UNDP) has approved assistance for the establishment of a National Drilling Training Centre at Nagpur. The project is to be executed by the United Nations Department of Technical Co-operation for the development of which the government implementing agency will be the Department of Mines. The project headquarters will be located at the Mineral Exploration Corporation Ltd., Nagpur.

The project was approved by Mr. S. Varadachary, Joint Secretary, Ministry of Finance, on behalf of the Union Government and by Mr. Gamil Mamdy, Resident Representative of UNDP in India on behalf of UNDP. The UNDP assistance amounts to \$1.87 million over a three-year period. The Union Government will provide for personnel, indigenous equipment and buildings for

the centre, a UN Information Centre release said.

Under this project, UNDP is to provide a short-term drilling training consultant to review the work done by the subcontractor, subcontract for the provision of instructors and lecture material to conduct training courses in exploration, water well, geotechnical and directional drilling and training abroad for 24 national staff to update their knowledge of drilling skills. Advanced portable drilling equipment to support the training programmes to be conducted at the training centre and in the field will also be provided by UNDP.

PERSONALITIES

Mr. D.S. Mathur has been appointed General Manager -- Lube Refinery of Hindustan Petroleum Corporation Ltd. Bombay.

Mr. K.A. Iyengar has been appointed Managing Director of Mather and Platt (India) Ltd. Bombay.

Mr. Ashok P. Damle, Managing Director, Skip Plastics Pvt. Ltd., has been elected President, Indian Plastics Institute (Bombay Chapter).

Mr. P.R. Mankad has been promoted as General Manager (Marketing) of Gujarat Alkalies and Chemicals Ltd. Baroda.

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Plea to delink prices from world copper market

The public sector Hindustan Copper Limited (HCL), the sole producer of copper in the country, is pursuing with the Government its demand for delinking the price of indigenously produced copper from the international price. This is despite the fact that the high level of international price for copper has bailed out HCL from perpetual losses and helped it post a profit of Rs. 45 crores in 1988-89.

Indigenously produced copper and imported quantity are sold at a uniform price. Earlier, the imported price was much lower than the domestic cost of production which was on the higher side for historical reasons like poor quality of Indian ore and absence of adequate gold and silver elements in the ore, a factor which helped mines abroad to recover copper almost free of cost. Therefore, in spite of a high customs duty element, the indigenous producer was always at a disadvantage in terms of the pool price of copper because of its high cost of production. HCL, as a result, was saddled with accumulated losses of about Rs. 152 crores in 1986-87.

Sput on LME

The situation changed in 1987-88 when the international price as quoted on the London Metal Exchange (LME) started soaring and the imported price along with the duty element landed up near Rs. 1 lakh a tonne. For HCL this became a windfall since the pool price was much higher than the cost of production and the company posted, after a long time, a profit of Rs. 16.12 crores in 1987-88.

The upswing in the international price continued in 1988 too although the Government restructured the import duty to give some relief to the consumers. The high import duty (which was earlier necessary to provide a cushion to HCL) of 140% ad valorem was brou-

ght down substantially to Rs. 10,000 a tonne as specific duty and 30% ad valorem auxiliary duty, working out to about 50% ad valorem. Even at this level, the pool price provided a comfortable margin for HCL and the company could earn a profit of Rs. 45 crores in 1988-89, partly due to improved productivity. Simultaneously, its accumulated losses came down to Rs. 93 crores.

However, according to the newly appointed Chairman-cum-Managing Director of HCL, Mr. P.V. Venkatesan, the company is still pursuing with the Government the demand for delinking the indigenous price from the international price in view of the fact that it would cut out the uncertainty in its operations. Moreover, this was the most opportune time for such a move because the high international price would make it easier for consumers to accept the high cost of production of HCL.

The Bureau of Industrial Costs and Prices (BICP) has presented its report on the normative cost of HCL copper after taking into account the various handicaps and has fixed a price of about Rs. 68,000 a tonne. While this is much lower than the prevailing price of Rs. 88,000-92,500, depending on the grade, HCL is of the view that in terms of a long-term perspective, this would be a fair price which would enable the Government take investment decisions on future programmes of the Corporation. Even otherwise, the current price is heavily loaded with Customs imposts since the LME price works out to around Rs. 50,000 only, the balance being duties.

Full needs met

In 1988-89, HCL produced around 50,000 tonnes of copper while imports worked out to about 80,000 tonnes. An additional 20,000 tonnes were recovered from remelting of scrap, etc. which helped in meeting the full requirement of 1.50 lakh tonnes in that year.

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LICENSING POLICY FOR FERA, MRTP COS.

Liberalisation plan shelved

The Union government appears to have dropped the proposal for liberalising the industrial licensing policy for large houses and Fera companies, at least for the time being.

According to official sources, a proposal to this effect was sent to the Cabinet Committee on Economic Affairs (CCEA) a few months ago. It is learnt that the government felt that the time was not ripe for any major change in industrial policy now, especially with elections a few months away.

As per the proposal, companies covered under Section 20 (A) of the Monopolies and Restrictive Trade Practices Act (MRTP) were to be exempted from industrial licences under the Industrial Development and Regulations Act. This pertained to projects which involved investments in fixed assets up to Rs. 50 crores, especially in backward areas.

Incidentally, this is the second time that the proposal has been turned down. The first time it was sent to the CCEA around the second half of last year. At that time, the CCEA turned it down saying that the time was not ripe for such a change.

It was sent to the CCEA once again in the later part of 1988 with the argument that it would prop up investment in backward areas. It is now learnt that the CCEA has preferred to shelve the proposal. In fact, sources said, it was unlikely for the proposal to be taken up now. It is something like the white paper on public sector units they said.

The proposed liberalisation was in tune with the one effected in June last year for the non-MRTP and non-Fera companies. According to this, the government had enhanced the limit on the value of fixed assets for exemption from

industrial licensing for non-MRTP and non-Fera companies. Under this the limit was increased from Rs. 5 crore to Rs. 50 crores for projects to be located in Centrally backward areas and Rs. 15 crores for projects to be located in other areas provided that in both cases, such location does not fall within the specified distance limits from the boundaries of standard urban areas, municipal limits of cities and towns. The list of industries which continue to require compulsory licensing has been reduced from 79 to 26.

The industry ministry's argument in pushing for delicensing even for MRTP and Fera companies was that it would help promote industrial growth, productivity and efficiency. It was further felt that the entry of MRTP and Fera companies would help in pushing up exports.

Official sources at New Delhi point out that even though the government is keen to continue its liberalisation process, there are areas where it would prefer to go slow. A case in point being the delicensing of industries for MRTP and Fera companies. While they do not commit themselves to the fact that the proposal has been dropped, they are quick to say that it will not be taken up by the CCEA now. You make your own guess, they advise.

OIL TO RAISE \$ 50 M LOAN

Oil India Ltd. (OIL) will soon raise a commercial loan of \$ 50 million from the global market to meet the foreign exchange component of its projects. Talking to newsmen, Mr. Surjit Chaliha, chairman, OIL, said this would be in addition to the World Bank loan of \$140 million.

A part of this would be utilised to undertake detailed reservoir engineering studies. The studies would help OIL to determine the right enhanced oil recovery (EOR) technique for application in its fields.

* EXPORT * EXPORT * EXPORT * EXPORT * EXPORT * EXPORT *

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OIL to get two new areas for exploration

Two new areas -- the Ganga Valley and the Kutch Offshore -- are being allocated to the Oil India Ltd. for oil exploration. The Oil India Chairman, Mr. Surajit Chaliha, told newsmen at New Delhi on May 16, that the company had sufficient infrastructure and qualified manpower to undertake these new exploratory ventures.

The company plans to drill 5 exploratory wells at the Ganga Valley and 3 at the Kutch Offshore at an estimated cost of Rs. 160 crores in the Eighth Plan. He said the Eighth Plan outlay envisaged about Rs. 1,650 crores, including Rs. 600 crores, for exploratory drilling and seismic surveys. The onland development drilling would cost Rs. 375 crores and acquisition of various capital items about Rs. 675 crores.

Oil India's application for new petroleum exploration licence to operate in Ganga Valley and Kutch Offshore is being actively considered by the Government, according to the Petroleum Secretary, Mr. H.K. Khan. The company had already acquired sufficient experience in both onshore and offshore exploration programmes.

Mr. Chaliha said the Eighth Plan for the company envisages that survey and drilling activities in Rajasthan, Orissa Offshore, Andaman Offshore, Kutch Offshore and Ganga Valley would be carried through charter hire. Currently, the company has a fleet of 12 drilling rigs, two charter hire rigs and 14 workover rigs. The company plans to acquire one more deep drilling rig. Additional rigs wherever required would be acquired through charter hire, he added.

Meanwhile, the Govt. is examining the feasibility of permitting private companies to put up risk capital in oil exploration, according to a Petroleum Ministry spokesman. Hindustan Oil Exploration Co. (HOEC) is already having discussions with Oil India for working out a modus operandi for joint explorations in new areas. A memorandum of understanding is likely to be signed shortly between Oil India and HOEC.

Initially, HOEC may put in 40% of the capital to work in the Ganga Valley.

Reviewing the performance of the company's operations during 1988-89, Mr. Chaliha said the pre-tax profit was expected to be Rs. 90 crores, as against the target of Rs. 60 crores. However, the crude oil production of 2.424 million tonnes was marginally lower than the revised target of 2.5 million tonnes. The crude oil production target of 2.7 million tonnes, set for the current year would be met, according to the current rate of production. Oil India plans to conduct a river-bed survey of the mighty Brahmaputra and its adjoining swampy areas in January 1990. Costing about Rs. 20 crores, the project is expected to be completed in 18 months, Mr. Chaliha said.

DIGBOI FIELD MADE 'NATIONAL OIL PARK'

The Digboi oil field in Assam, the oldest and continuously producing oil

field in the world, is being declared as a 'national oil park'. This step is part of the centenary programme of the country's petroleum industry. Though oil hunt began in the country in 1866, commercial discovery of oil was made in 1889 at Digboi, just seven years after Col. Drake drilled the world's first well in the U.S. The first well at Digboi was spudded in September 1889. Oil was struck at a depth of 178 feet in October, the same year. Today, Digboi oil field, operated by Oil India, still produces oil.

The centenary celebrations to be launched in Duliajan on November 4, include release of an Indian postage stamp and a book on the history of the discovery of oil in India, according to official sources. An advisory committee under the chairmanship of the Petroleum Secretary, Mr. H.K. Khan, has been formed to plan programmes for the centenary celebrations. All the public sector undertakings under the Petroleum Ministry will actively participate in the programme.

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Indian Oil signs MoU with Government

Indian Oil Corporation (IOC) signed a memorandum of understanding (MoU) at New Delhi on May 15 with the Government laying down performance targets for 1989-90. Indian Oil is one of the seven public sector enterprises selected to sign an MoU with the Government this year in addition to the 11 PSUs which had signed such memoranda last year.

The MoU states that Indian Oil will ensure supply of quality products to customers and maintain strict quality control checks. It will further enhance customer satisfaction through expansion of reseller network by commissioning of retail outlets, SKO/LDO dealerships and LPG distributorships.

The corporation is also expected to provide adequate storage facilities to ensure regular supply of petroleum products. This will include arranging and monitoring on a regular basis supply of LPG to customers to avoid backlog subject to availability of gas. According to

the MoU, Indian Oil is expected to enroll 5,00,000 new LPG customers and commission 105 LPG distributors during '89-90. It is also expected to bottle 8,60,000 tonnes of LPG during the year.

An ambitious target of Rs. 732.92 crores profit before interest, depreciation and tax has been fixed for Indian Oil. The corporation will mobilise its resources for capital investment without seeking budgetary support from the Government. The Govt. has agreed to accord approval on a time-bound basis to the proposals of Indian Oil for eight projects estimated to cost Rs. 1,132 crores. These include the Kandla-Bhatinda product pipeline, modernisation of the Digboi refinery, reformers at Digboi and Barauni refineries and revamp of lube oil block at Haldia.

GLOBAL WARMING WILL AFFECT RICE CROPS IN INDIA

Global warming, a growing climatic phenomenon poses a threat to the pro-

spects of rice crops in India, China and other rice growing countries which supply 2.7 billion people with more than 70 per cent of their calories. At a special hearing of the US Senate at Washington recently, experts warned that rice yields might be severely reduced due to increased temperatures associated with global warming.

POTASSIUM CHLORATE SHORTAGE

The hand-made match industry in Tamil Nadu, is facing a crisis due to the acute shortage of potassium chlorate, an essential raw material resulting in layoffs and retrenchments.

Mr. S. Maheswaran, president of the Sivakasi-based All India Chamber of Match Industries, appealed to the Centre to abolish the 135 per cent import duty on potassium chlorate. The price of 50 kgs of the raw material has increased from Rs. 1,063 to Rs. 2,000 in the past 10 days, he said.

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OIL to set up underground gas storage facilities

bring down the incidence of flaring of associated natural gas in Assam, India Ltd. (OIL) has decided to set up facilities for storing the surplus gas in underground reservoirs in the region and to set up a supervisory control and data acquisition (SCADA) system in upper Assam.

OIL produces 4.2-million cubic metres per day of gas from the eastern sector. Out of this about 38 per cent is flared mostly because of the non-availability of the committed quantity by the consumers. OIL has now initiated a project to store the associated gas which is rendered surplus in underground gas reservoirs in Assam. The stored gas can be produced as and when the situation demands during peak demand and/or lean production period. Such underground storage facilities already exist in various developed countries, but it will be the first such venture in India.

To closely monitor and control the production, utilisation and storage operations of associated natural gas from its fields in upper Assam, OIL has entered into a turn-key contract with ECIL of Hyderabad to put up a microprocessor-based SCADA system. The project is estimated to cost about Rs. 9 crores.

The SCADA system consists of receiving and transmitting various gas flow parameters to a central computer through VHP/UHF communication system from different oil collecting stations (OCSs), gas wells, gas offtake points, etc. and processing the data at the central computer for control/monitoring the operations at remote stations. Installation of such a system in OIL's fields will enable better management and utilisation of this produced associated gas, ensuring better monitoring and control of the gas compressor, thereby reducing avoidable gas flares in the fields.

The present associated gas production figure of OIL from the eastern sector put at 4.2 million standard cubic metres per day is expected to reach up to five million standard cubic metres per day by the end of the next Plan.

When the committed consumers fail to lift their share it leads to persistent flaring of large quantities of gas as there are no fall back users in the State. OIL has made a maximum commitment of 3.28 million cubic metres of gas per day to various downstream industries.

Broadly, the gas commitment to external users would be 57.8 per cent to process industries such as the Hindustan Fertiliser Corporation and the Assam Petrochemicals Ltd., both located at Namrup, 24.4 per cent for power generation by the Assam State Electricity Board and 17.8 per cent for use as fuel by the Indian Oil Corporation's refinery at Digboi and by various tea gardens.

At present the Nahorkatiya and Jorajan oilfields are connected by a common gas grid. The gas from these areas is supplied to the consumers through the Assam Gas Company Ltd. (AGCL), a State Government undertaking.

To minimise flaring of gas, OIL has committed one million cubic metres of gas per day to a gas-based power plant to be set up at Kathalguri in Assam. In addition to this, OIL has very recently committed 0.124 million cubic metres of gas to AGCL for Dibrugarh gas grid. The gas will normally be supplied from OIL's Nahorkatiya field so that any surplus associated gas during the periods of low upliftment by outside consumers, can go to Dibrugarh gas grid. This additional commitment of gas will help in reduction of avoidable flare at the time of low offtake by outside consumers. The present estimate of balance recoverable reserves of associated gas in

the already discovered oilfields in OIL's operational areas in Assam is of the order of 53 billion standard cubic metres.

HBJ GAS MAY BE DENIED TO FARIDABAD PROJECT

Will the gas from the HBJ pipeline which has just neared Delhi be supplied to Haryana for the proposed gas-based power plant at Faridabad? There are moves backed by powerful political interest to take the gas for a gas-based power plant by Delhi Electricity Supply Undertaking at Dadri and deny it to the Faridabad plant for which gas has already been committed.

These moves, however, have been temporarily stalled as the Delhi administration has no funds to spare beyond what has been provided in its annual plan for 1989-90. The proposal for an additional gas-based plant at Delhi has apparently come from top political level. It can lead to the postponement of even suspension of the Faridabad plant for which NTPC is preparing the project report. The Department of Power has denied that giving an additional gas-based plant for Delhi would mean dropping of the Faridabad project. However, in the present availability of gas, Faridabad plant would not be sustainable.

CEI WELCOMES SPS, EXPORT INCENTIVES

Mr. J.P. Chowdhary, president, Confederation of Engineering Industry (CEI) has welcomed the recent initiatives of the ministry of commerce in regard to exports. In particular, CEI has appreciated the formation of the Board of Trade with wide ranging terms of reference. The CEI chief has expressed the view that the Board of Trade can play a key role in forming India's export strategy for the '90s, resulting in Indian industry going global and becoming a major player in world trade. CEI has also appreciated the government's initiatives in simplifying the procedures for making available export incentives to the exporter.

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Plan for gas pipeline in Godavari belt

The Oil and Natural Gas Commission (ONGC) is planning to lay an ambitious gas trunk pipeline network in the East and the West Godavari districts of Andhra Pradesh to connect all the drilled structures in the Krishna-Godavari Basin with a provision to connect the undrilled structures in the future as well. The various consumers identified for picking up the gas include Nagajuna Fertilisers, Vizag Steel Project, Tata Iron and Steel Company, Andhra Pradesh State Electricity Board (APSEB), Madras Fertilisers, Godavari Fertilisers and Steel Authority of India Ltd., at Yanam, besides the Amalapuram project (3 x 710 mw) of APSEB. The Pondicherry Electricity Department has also expressed its willingness to use the gas.

The pipeline network covering over 150 km. comprises the following sections: Tatipaka to Kakinada (80 km), Mandapetta junction point to Tatipaka-Kakinada (16 km), Surasanyanam (landfall point of the offshore gas line) to junction point of Tatipaka-Kakinada line (11 km), Mandapetta to Rajahmundry via Balabhadrapuram (50 km) and Balabhadrapuram to Bhavanarayanaapuram junction point of Tatipaka-Kakinada line (24 km).

Starting from Tatipaka, the pipeline route passes through Gudala where Ravva gas from offshore joins in through an 18 inch diameter pipeline. From Gudala, the pipeline will be laid upto Kakinada via Kudalammacheruvu (58 km). From Kakinada, the distribution lines to various consumers would be connected based on the requirements. The Tatipaka-Pasarlapudi project, located about 25 km., north-east of Narsapur town, is situated within the island block area enclosed by the Vasistha Godavari and Vainateyam Godavari rivers. So far, all the five wells drilled in the Tatipaka and Pasarlapudi structures have proven to be gas-bearing. The gas reserves of Tatipaka and Pasarlapudi structures are estimated to be 26.85

million cubic metres (26.85 million tonnes of oil equivalent of gas). The production scheme for the development of these structures envisages a production rate of about 2.5 cubic metres of gas per day for about 15 years (Tatipaka 0.3 mcm per day and Pasarlapudi 2.2 million cubic metres per day).

A number of satellite structures have been identified in the island area and are awaiting drilling. Some of them are likely to be commercial gas producers. Recently, Chintalapalli in this area produced huge quantities of gas. The exploration in the Amalapuram-Bhimanapalli sector would also be taken up. Exploratory activities in the Eighth Plan is expected to be intensified in the area close to coast though it is considered to be logistically difficult. The Mandapetta structure situated in the East Godavari sub-basin about 40 km. from Rajahmundry is another highly prospective gas area. The gas reserves' prospects range between 26 million cubic metres and 35 million cubic metres. ONGC envisages drilling a number of delineation wells to prove the potential of the prospect. As per present indications, the ultimate production potential of this field may build up to 2 million cubic metres of gas per day in stages. The structure is being taken up for development in two phases.

Phase-I of the Development of Mandapetta consists of a temporary processing facility with a 49 km. pipeline up to Kakinada via Balabhadrapuram. The gas is to be supplied to Nagarjuna Fertilizers at Kakinada through a branch pipeline from Kakinada. Phase-II of the development consists of permanent facility (gas collecting station) capable of handling two mcm. per day with a provision for further expansion. A 72-km gas pipeline from Narsapur to Kovvur has already become operational. Combined with the recent plans, these are expected to give a big thrust to the industrialisation process of the East and West Godavari districts. About 10

chemical and agro industrial units have been initially committed about 1,39,000 cubic metres of gas per day from the wells around Narsapur and Razole.

Five industrial units have already started picking up gas. The Andhra Pradesh Industrial Development Corporation is also planning to utilise the gas for the production of ammonia/urea, methanol and sponge iron. Nearly half a million cubic metres of gas is also committed to be supplied to APSEB. The Narsapur-Kovvur line has also now been extended to connect the Tatipaka structure through a 14-inch, 26.5 km pipeline.

The total production potential of gas in the Krishna-Godavari basin from the already discovered and likely to be discovered fields in onshore and offshore is expected to be about 6 million cubic metres of gas per day (on-land-five million cubic metres per day and offshore - one million cubic metres per day. As per a tentative plan, about 225 wells (onland-144 and offshore-81) will be drilled to establish a reserve potential of 256 million tonnes of oil and oil equivalent of gas which would be required to sustain the above mentioned rate of production by the end of the Eighth Plan.

EoUs MAY BE ALLOWED TO EXPORT IRON ORE

The Government may permit 100% export-oriented units for the export of iron ore it is learnt. Applications from mine owners and exporters have been pending with the ministry of commerce for some time. A decision could not be taken on them because the Central Board of Excise and Customs told the ministry there would be difficulty in bonding facilities for such export-oriented units at different locations. The board of approval is understood to have decided that the cases should not be rejected on this ground. Since the govt. is keen on increasing exports, these cases may be put to the Cabinet sub-committee on exports, for a decision.

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4TH ROUND BIDS FOR OIL HUNT

Flexible approach to woo foreign companies

The Union Government has decided to call for the fourth round of bids from experienced oil companies for exploration in offshore and onshore blocks on production sharing basis some time late this year.

According to official sources, several foreign companies have approached the Ministry and shown interest in undertaking exploration activities in India. The performance of the foreign companies which had picked up several offshore blocks in the third round so far, is also termed satisfactory by the official circles in New Delhi. The Union Government has asked the Oil and Natural Gas Commission (ONGC) and Oil India Ltd. (OIL) to identify the set of blocks that can be offered for exploration to the private companies in the next round.

The Government expects reasonable response from the companies to the fourth round. The Government has now adopted a flexible approach for the bids to get maximum response from foreign oil companies. The bidders are given a seismic option allowing them to relinquish an area if the results of seismic surveys does not enthruse them to take up exploratory drilling.

Bank guarantees for entire commitment are not insisted upon, tax obligations are made easier and contract signature bonus and production bonus paid by contractors have also been dispensed with. The production sharing terms provides that the entire exploration risk will be borne by the private companies who would take up drilling work according to a phased programme. If no oil is discovered, these companies would have the option to terminate the contract. In case oil is discovered in commercial quantities as a result of exploration operations, OIL and ONGC will have an option to receive its corresponding share of petroleum.

The exploring companies are also required to share crude oil with the Government after they have recovered their costs. This sharing will be on a sliding scale. The companies will also share with the Government a higher proportion of their profits as the economics of their project improves. All the oil produced in the contracted block will be made available to the Government at international market price till India reaches the level of self-sufficiency.

The contract provides for the Government to enter into separate agreements with the companies for transfer of technology. ONGC and OIL personnel would be associated with the exploration activities in the contracted block to give them exposure to the exploration techniques used by the foreign companies.

In the first round of bidding in 1980, 32 blocks -- 15 onshore and 17 offshore -- were offered for exploration by foreign oil companies. India had received bids from four companies for two blocks. The round resulted in one contract being signed for Saurashtra offshore block with Chevron, of the US. During the second round in 1982, 50 blocks were offered -- 8 onshore and 42 offshore. Only one company showed interest in two offshore blocks, but no contract was signed as a result of this round.

In the third round, 27 offshore blocks were offered for exploration by foreign oil companies. The blocks were in Saurashtra and Kerala, Konkan basin on the Western coast and Cauvery, Palar, Krishna-Godavari and Mahanadi basins on the east coast.

ONGC TEAM FINDS OIL AT KAMALAPURAM

Kamalapuram, in the oil-bearing Nannilam region in Tamilnadu could

well be a potential oil source, the ONGC drilling team in the Cauvery basin feels. Oil was struck at a well drilled in the area, raising hopes of new discoveries. The well, which was spudded on June 30 and drilled upto a depth of 3,600 metres, will be taken up for detailed investigation and study. It is proposed to intensify drilling in the region, as indication of oil availability has provided the necessary direction for further exploration.

The ONGC team is looking for better locations at Kamalapuram, and the data that will be available from the present well will help attain success ultimately, the sources indicated. Oil was struck at Nannilam almost a year ago, and presently seven rigs are engaged in drilling in the basin in Narimanam (4 rigs), Kovilkalappal (2) and Kamalapuram (1). With success stories in Narimanam, Kovilkalappal and Bhuvanagiri (S. Arcot), "Early Production Systems" have been developed in order to reach regular production of crude. The fourth EPS is to be established at Nannilam in June, 1989.

The exploratory drilling at Komarakshi, near Bhuvanagiri, has not been successful for ONGC. The Russians are currently drilling in two places viz. Bhuvanagiri and Andimadam.

MALLYA TO SET UP PAINT UNIT IN UAE

Mr. Vijay Mallya, of the UB group is setting up a joint venture in the United Arab Emirates to manufacture paints. Dubai's English daily 'Gulf News' quoted him as saying that he had big plans and that six top executives of his various firms were with him to sort out 'important' matters. Mr. Mallya, and Sharjah-based businessman Abdulrahman Bukhatir, are to restart the 1.6 million litre-a-day Khaleej Paints and Chemicals factory. Mr. Mallya was participating through his UK firm, Berger J and N group, the control of which he had acquired last year in a £ 17 million deal.

Hardening import prices bring new problems for oil planners

The developments on the oil front in 1988-89 have given rise to hopes that a new trend in output of crude and natural gas will emerge in the coming years and it may not be necessary to increase imports of crude and petroleum products to the full extent of the rise in consumption. During 1985-88, the output of crude was stagnant around 30 million tonnes and the utilisation of gas, associated and free, could not be stepped up because of the delays in construction of gas-based fertiliser plants and combined cycle power projects. The production of crude increased to 32.18 million tonnes in 1988-89 from 30.36 million tonnes in 1987-88 and that of natural gas to 12.85 billion cubic metres from 11.47 billion cubic metres.

Focus shifts to gas

The growth in natural gas availability has, of course, been quite impressive

in the current Plan period as the output in 1985-86 was only 8.13 billion cubic metres. This means an increase of 58% in three years. While strenuous efforts have to be made to intensify oil exploration and exploitation, the problem in respect of natural gas relates not to the stepping up of its output, but to the location of large consumers. Because of the delay in completing three gas-based fertiliser projects in Gadpen, Babrala and Shajahanpur, the Gas Authority of India has been compelled to increase the use of gas for power generation and substitution of coal or fuel oil where they were used for burning in boilers.

The existing producers of fertilisers based on naphtha are also switching over to gas as feedstock where it is found more advantageous and regular supplies can be ensured. Even though the Bassein free gas structure was ready

Overall trends in the Petroleum Sector

in 1987-88, its reserves could not be drawn upon as associated gas being concurrently produced with crude from Bombay High had to be accorded priority for minimising flaring.

Encouraging offtake

With the efficient functioning of the mammoth Thal Vaishet and Hazira fertiliser plants and the commissioning of three fertiliser plants in Bijaipur, Aonla and Jagdishpur, along with combined cycle power plants in Anta and Auraiya the offtake of gas has improved considerably in recent months and a more pronounced rise in output and consumption may be recorded in 1989-90, with the two power plants also scheduled to be in full operation. Another promising avenue for large scale use of gas is the direct reduction of iron ore in which a number of private sector units have shown interest.

The HBJ grid has been completed upto Babrala and is being extended to

	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89 (estimate) (in million tonnes)
Output of crude	21.07	26.02	28.99	30.17	30.48	30.36	32.18
Output of natural gas (in billion cubic metres)	4.94	5.96	7.24	8.13	9.85	11.47	12.85
Throughput of refineries	33.16	35.26	35.56	42.91	45.70	47.75	47.28
Output of refined products	31.07	32.93	33.24	39.88	42.76	44.73	45.45
Gross imports							
Crude: Quantity	16.95	15.97	13.65	15.14	15.48	18.05	17.49
Value (Rs. crores)	4,043.74	3,541.05	3,430.34	3,686.80	2,120.00	3,065.00	2,740.00
Petroleum products:							
Quantity	5.03	4.33	6.09	3.87	3.05	3.93	6.04
Value (Rs. crores)	1,553.94	1,270.75	1,914.91	1,273.60	653.00	973.00	1,353.00
Total quantity	21.98	20.30	19.74	19.01	18.52	21.98	23.53
Value	5,597.98	4,811.80	5,345.25	4,960.40	2,773.00	4,038.00	4,093.00
Net imports							
Crude: Quantity	12.40	10.45	7.16	14.62	15.48	18.05	17.49
Value (Rs. crores)	2,980.37	2,309.95	1,867.18	3,551.65	2,120.00	3,065.00	2,740.00
Petroleum products							
Quantity	4.23	2.86	5.16	1.90	0.56	0.52	3.93
Value (Rs. crores)	1,420.16	913.69	1,659.88	764.02	242.00	324.00	888.00
Total net imports							
Quantity	16.63	13.30	12.32	16.52	16.03	18.56	21.43
Value (Rs. crores)	4,400.53	3,223.74	3,527.06	4,315.67	2,362.00	3,389.00	3,628.00

Dadri in Uttar Pradesh where it is proposed to establish combined cycle power projects for augmenting generation of electricity and meeting the requirements of the Delhi region.

With the processing of natural gas at Hazira and other fractionation plants, the output of liquefied petroleum gas too has been rising impressively. But the demand for these products is far in excess of supply and, even with connections to an additional million consumers in 1988-89, the waiting list has not contracted significantly.

Widening gap in oil products

The consumption of petroleum products has been rising steadily notwithstanding an increase in use of natural gas and liquefied petroleum gas for producing fertilisers, increasing power generation and for cooking purposes, displacing to some extent the use of kerosene. The total offtake of products is estimated at 48.53 million tonnes against an aggregate refinery output of 45.45 million tonnes in 1988-89 as compared to 46.42 million tonnes and 44.73 million tonnes respectively in 1987-88. As exports of surplus products accounted for 2.11 million tonnes, net availability from indigenous sources was 43.35 million tonnes. A gap of a little over five million tonnes between demand and net supply had to be met by imports.

Policy slant will need revision

The Government's policy has obviously been to minimise imports of crude and increase those of petroleum products in deficit. It is not clear whether this procedure has been prompted by capacity constraints in refining or the apparent financial advantage in importing refined products because of lower prices in world markets. This policy cannot continue in 1989-90 as there has been a sharp rise in world prices for crude and petroleum products in recent months following the interruption to oil production in the North Sea area and no significant seasonal contraction in oil

consumption after the winter months. The output of crude will, of course, be rising to 34 million tonnes in 1989-90 and the uptrend may be maintained in the Eighth Plan with better use of the reserves of Bombay High and Gandhar oilfields in Gujarat and increased production from the oil wells in the Krishna-Godavari and Cauvery basins.

Capacity constraint in refining

There will, however, be a bottleneck in refining capacity as even with the completion of the debottlenecking and expansion schemes of the existing refineries, the total capability will be only 49.85 million tonnes besides swing capacity of two million tonnes in the Bombay refinery of Hindustan Petroleum Corporation. It is targeted that the refineries should handle 51 million tonnes in the current financial year but it will be difficult to achieve a throughput of this magnitude if one or two of the existing refineries had to be shut down for the usual overhaul.

As the expansion of capacity at Koyali to 9.50 million tonnes from 8.10 tonnes and that of Mathura to 7.5 million tonnes from six million tonnes have been completed, there is no likelihood of a significant increase in refining capacity in the next two or three years. With rising consumption and the need to increase refinery throughput by at least two million tonnes annually, it is imperative that quick decisions are taken on expansion of capacity of the existing refineries which are conveniently placed from the point of view of consuming areas.

The joint venture projects at Karnal and Mangalore may be completed in four or five years, while the preliminary work on the proposed new refinery in Assam with an initial capacity of two million tonnes is yet to be taken up. The crude distillation facility with a capacity of five lakh tonnes at Narimaram in Tamil Nadu will be processing only crude from local oil wells and there may not be any significant addition to the

total output of refined products. The immediate difficulties can, therefore, be overcome only with expansion of the Cochin, Madras or Haldia refineries, which can be executed in less than two years.

Import cost may go up

The import bill has been rising and would have been prohibitive but for the fact that world prices for crude and products were declining in 1985-88. A quantity of 15.48 million tonnes of crude and 3.04 million tonnes of products having a value of Rs. 2,773 crores was imported in 1986-87. This went up to 18.05 million tonnes and 3.93 million tonnes respectively costing Rs. 4,038 crores in 1987-88. The net imports had a value of Rs. 2,362 crores and Rs. 3,389 crores in the two years.

In the nine months ended December 31, 1988, crude imports totalled 13.12 million tonnes and products 4.53 million tonnes resulting in an outgo of foreign exchange to the extent of Rs. 3,070 crores. Net imports were for Rs. 2,721 crores and the total for the whole of 1988-89 may be around Rs. 3,600 crores. As the average prices are likely to be much higher in 1989-90, every effort must be made to moderate the growth in consumption of petroleum products with better use of natural gas and electricity.

-- The Hindu

HEAVY WATER LEAK IN KARACHI

About 3,500 kg of radioactive heavy water leaked out of Pakistan's only nuclear power plant at Karachi last month, but officials have said the accident posed no danger.

"There was no release of any harmful radioactivity from the plant to the environment," Pakistan Atomic Energy Commission announced. The leak occurred on April 18 when the plant, situated on the Arabian seashore, was shut down for inspection and maintenance.

Working group wants pivotal role for exports in Eighth Plan

A Planning Commission working group has said that exports must be made a core plan activity to achieve a 12 per cent annual volume growth rate for exports during the Eighth Plan. Taking a base figure of Rs. 24,000 crores in 1989-90, the working group says that exports should reach about Rs. 42,000 crores by 1994-95 in constant terms. At this level, exports will be 8.4 per cent of the gross domestic product (GDP) in the terminal year of the Eighth Plan.

The working group report says that the task in the Eighth Plan is to break from the past and set the stage for a sustained expansion in India's exports. The record of the past three years shows that with a focussed effort, this is possible. The report says that although the average growth should be 12 per cent, in the terminal year of the Eighth Plan, the growth rate must be nudged up to reach a rate of about 15 per cent. Therefore, exports must be made a core plan activity instead of just being treated as a residual sector.

Based on an analysis of past performance, comparative advantage and future potential, the group has classified the export products of the 90s into three categories: export sunrise products, export star products and other products.

The working group has assigned sunrise status to branded and end consumer products. Export sunrise and star products require a more enabling environment with a different regime of industrial planning, technology imports and manufacturing flexibility. For the category 'other products', it is not easy to detach exports from domestic industry and growth will have to be necessarily lower.

The working group is of the view that it is useful to enunciate a five-year package for policy reform aimed at enhancing exports. Such a programme

would have to be subsumed in a wider programme of economic policy reform to push the economy to a higher growth path. Indian economic policy has relied excessively on the instruments of import tariffs and restrictions to provide high effective protection to domestic industry. It is recommended that a well-qualified secretariat be established to assist the existing interministerial committee of secretaries to devise such a wide-ranging policy reform.

The report says that any reform of the tariffs and import policy regime would be possible only if the exchange rate instrument is used more aggressively. In such a policy change, the premium on imports which are currently made by those producers who obtain access to imports, would effectively shift to exporters. The benefits of such a policy reform would be manifold, the most important being that exporters would progressively become more price competitive.

It has recommended that the flexibility of export related import licences should be increased so that the premium on import shifts to the export sector. Exporters should be allowed to utilise a proportion of their foreign exchange earnings for importing any commodity (except those on the banned list) without any licensing formalities. The government is already considering ways and means of shifting the disbursement of CCS from CCI & E to commercial banks. There is a strong case for merging disbursements of all incentives with one agency -- commercial banks. For such a scheme to work efficiently, the government may consider a mechanism to review technical co-efficients constantly and to expand the list to take into account all the new products. This task could be entrusted to BICP.

While much progress has been made in providing access of imports to

exporters at world prices, it is essential to extend these benefits to indirect exporters to improve backward linkages. A system of domestic letters of credit linked with the opening of foreign letters of credit has been suggested. At present pre-shipment export credit is typically given to cover 80 per cent of purchased inputs. It is recommended that this be expanded to cover 100 per cent of inputs and at least 50 per cent of value added.

Exports must be perceived as a national priority, palpably and visibly. The success of very senior people, body language of administration and awards for extraordinary achievements in the exports are key ingredients in a strategy for change. A high pitched national campaign on exports should be launched. Putting exports on a pedestal and as a national priority also requires significant and noticeable measures to bring the country closer to the ideal basics from an international standpoint.

The reservation policy for the small scale sector needs to be reviewed and updated. In the context of India's export thrust and proposed categorisation of products into sunrise and star products, it is impractical to expect a global scale of entry by a company based purely on exports, the report says.

For units exporting more than 25 per cent of their production, "we must consider whether we at all need licensing". The working group considers it an avoidable bureaucratic hurdle.

It says that for export-oriented acquisitions, take-overs and leases, MRTP approvals must be eliminated. Each such bureaucratic station makes the export journey tedious and uncompetitive. The group has demanded an overhaul of FERA as this is quite anti-exports. Exports are a risky business where innovations and aggressiveness are essential and the current rules do not encourage these aspects, the report says.

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SPOTLIGHT ON

Biotechnology & Life Sciences (Part 2)

REGULATORY PRESSURE ON THE US PESTICIDE INDUSTRY LEADS PESTICIDE INDUSTRY TOWARD BIOTECH BASED PRODUCTS

Regulatory pressure on the US pesticide industry is progressively increasing. This pressure will continue to exact a heavy price on the industry, while continuing to play an important role in a company's strategic planning. EPA has stepped up its study of pesticides effects on groundwater contamination, food quality and worker safety. In particular, the Agency is closely scrutinising aldicarb (Rhone Poulenc) impact on groundwater.

Tightening regulations mean that products that have been around a long time are under a lot of stress and some of those will be taken off the market. Therefore, there will be a pressing need for new products. The new products have to be environmentally sound and have to generate significant earnings.

This philosophy has led the industry to develop lower toxicity and reduced input compounds like Cynamid's 'ceptor'. It is also leading them towards biotechnology based products. At present, no genetically engineered or altered products have gained commercial approval from EPA, but several are now in the field testing stage. According to Dow's Nick Hein, the timetable for biotechnology products appearance in the market place starts with the introduction of herbicide resistant crops in the next 5 to 10 years. Monsanto's field testing a genetically engineered corn resistant to its herbicide 'Roundup' will be followed by insect resistant crops, late in the next decade. According to Monsanto's researchers by 2000, 5 to 15% of crop protection pur-

chases will be for biotechnology products. (CMR, 1/2/89, p. SR 18)

RESEARCH ON WHITE ROT FUNGUS TO DETOXYFY CHLORINATED COMPOUNDS

New Jersey Institute of Technology, recently dedicated an Advanced Technology Centre, which will house the Hazardous Substance Management Centre. Researchers there are working on reactor designs that will allow the breakdown of chlorinated compounds using white rot fungus, rather than bacteria, with O-chlorophenol as the target material. Noting that fungus is more difficult to handle than bacteria, researcher Gordon Lewandowsky explains 'We have first begun using aerobic and anaerobic processes. The anaerobic organisms perform reductive dechlorination, then we degrade the compounds further with aerobic organisms'. Therefore white rot fungus is another powerful agent for degradation of chlorinated compounds. (CMR, 11/21/88, p. 41)

KAKETSUKEN INSTITUTE OF JAPAN UNVEILS A NEW RECOMBINANT HEPATITIS-B VACCINE

Kaketsuken, the Japanese research institute is planning to launch a recombinant hepatitis-B vaccine into the South East Asian and Chinese markets. The Institute expects to finalise its export plans within the first six months of 1989.

The vaccine was developed by the Institute in collaboration with Osaka University's Institute of Molecular and Cellular Biology and Japan's Science and Technology Agency. The agency and the institute have applied for patents in Japan, USA and Europe for the recombinant plasmid used in vaccine

production. The vaccine is made from viral proteins mass produced by a genetically manipulated yeast. This technique is also used by the other players in the market; Merck, Sharpe & Dohme and Smith Kline & French.

Hepatitis-B is a major cause of cancer deaths in the Far East and South East Asia. Merck, Sharpe & Dohme has already signed deals with the Japanese drug firms Shionogi and Banyu to access the potentially lucrative Japanese market, where 100,000 people are affected each year.

While other Japanese firms are seeking similar deals, Kaketsuken is the only native recombinant hepatitis-B vaccine maker. The Institute is unlikely to prosper outside Japan until it reduces its manufacturing costs. (ECN, 1/23/89, p. 38)

BASF PLANS A NEW MULTIMILLION DOLLAR RESEARCH CENTRE FOR BIOTECH IN USA

BASF Corporation of West Germany last November unveiled their plans for building a \$45 million biotechnology laboratory and pilot plant facility in the Boston, Mass area in USA. The installation is expected to be operational by 1991 with 60 scientists. They will concentrate on developing pharmaceuticals for the treatment of cancer and immune diseases.

The new facility will complement BASF's biotechnology research centre in Ludwigshafen (West Germany), where the Company reported recently developments in processes for Vit B2 and natural flavours as well as D-lactic acid and TNF. The latter are under development for treatment of certain forms of cancer. (CMR, 11/14/88, p. 4)

CYCLOPENOL — A NEW ANTIBIOTIC FROM A FUNGUS PROVES A GOOD NATURAL FUNGICIDE

Researcher Hank Cutler at the USDA's Agricultural Research Service has recently reported the isolation of a chemical antibiotic (called Cyclophenol) from the fungus *Penicillium cyclopium*. Cyclophenol has proved 95% effective in stopping the growth of another fungus that caused the Irish potato famine of the 1840s.

Cyclophenol is one example of fungal chemicals that have potential to repel disease-causing organisms, regulate plant growth and even serve as human drugs similar to penicillin.

The researchers at USDA have been researching plants and insects, as well as fungi, as sources of a new generation of natural agricultural chemicals. Natural compounds hold great promises. They work against specific targets, can be extremely potent and because they are biodegradable, they do not pose environmental hazards. (*CMR*, 11/14/88, p. 30)

ENZYMES IN ORGANIC SOLVENTS — PERSPECTIVES AND PROSPECTS

The vast majority of enzyme catalytic processes are carried out in water, as conventional wisdom holds that enzymes work only in aqueous solution. The use of solvents other than water for the study and exploitation of enzymes has been investigated only recently. In recent years, many enzymes have been shown to function successfully in organic solvents. Researchers have found two methods for producing functional enzymes within organic solvents. These are solubilisation of enzymes inside oil soluble surfactant aggregates (reversed micelles or microemulsion) and suspension of 'damp' solid enzyme in the solvent. These sys-

tems offer a continuously variable range of micro environments for enzymes from wet to dry with concomitant changes in enzyme reactivity, stability and substrate specificity.

Enzymes in organic solvents offer great potential for the biocatalysis of a wide range of chemical processes that do not occur in water. These include enzymatic conversion of petrochemicals, polymerization, transformations of oils and fats, and the enzymatic analysis of organic compounds extracted using apolar solvents.

The study of enzymes in organic solvents is at an early stage, and in many aspects of the applications of these systems, including scale-up, cost effectiveness relative to alternative processes, product separation and enzyme recovery, have not yet been investigated in detail.

The investigation of enzyme (and other biomolecular) properties in surfactant aggregates is of continuing interest insofar as these systems offer an alternative to bulk water as medium resembling the environment of species in vivo. To the biotechnologist, however, the narrow range of stability of the surfactant phases, the difficulties of surfactant removal in product and enzyme recovery and the relatively low reagent concentrations, make it unlikely that their systems will find a major role in large scale processes.

Many of these disadvantages are circumvented by the use of solid suspensions. The fact that enzymes can be made to work in organic solvents is likely to stimulate investigators into other for the exploitation of biocatalyses in organic solvents. These may include the use of immobilized systems or enzymes made soluble in oils through covalent attachment of hydrophobic groups. Freedom from the constraint of working in water as solvent offers the enzyme biotechnologist an exciting new perspective from which to re-evaluate

the uses of enzyme catalysis in chemistry. (*Enzyme Microb. Technol.*, (1989) Vol 11, p. 55-56)

THE BIOTEXT INTERNATIONAL DIRECTORY OF HEALTHCARE BIOTECHNOLOGY COMPANIES

Biotechnology has progressed in several countries round the world. Therefore the publishers of Scrip have published a special directory which contains details of over 520 companies and institutions involved in the development of healthcare biotech products.

The organisations listed are all involved in recombinant DNA, monoclonal antibody or cell culture technologies in the areas of human and veterinary therapeutics and diagnostics. The Directory contains names, addresses, telephone, telex, telefax numbers of companies and institutions in as many as 29 countries. The directory is priced at \$68/35 pounds and may be ordered from Sue Maloney, Bookshop Sales Manager, Scrip, 18-20 Hill Rise, Richmond, Surrey, UK. (*Scrip*, 2/10/89, p. 6)

HERBICIDE TOLERANCE ENGINEERED INTO COTTON

Monsanto scientists have genetically engineered cotton for tolerance to the Company's non-selective Roundup herbicide. Calling such tolerance a trait of major commercial significance Monsanto reports it anticipates commercialization of genetically engineered cotton with Roundup herbicide tolerance as early as the mid 1990s.

The cotton plants were produced using a gene transfer system mediated by *Agrobacterium tumefaciens*. The agrobacterium has the natural ability to transfer some of its own DNA into plant cells, but the result is usually a type of injury known as crown gall.

Monsanto researchers developed a method to stop the microorganism from

causing crown gall but keeping its ability to insert DNA into plant cells. Altered plant cells were then regenerated into healthy cotton plants using tissue culture. Monsanto also recently announced success in genetically engineering soybeans for Roundup herbicide tolerance. (*C & EN*, 19/28/88, p. 2)

A NEW PROBE FOR TESTING DNA CONTAMINATION

A new probe, developed for testing DNA contamination in drugs made by r-DNA or monoclonal antibody techniques, cuts the hands on time required for that test from about 18 hours down to 0.5 hours, and lowers the cost from \$200-1500 down to about \$100. According to Molecular Devices (Menlo Park, (A)), which came up with the new test, those are the standard times and rates for conventional radioactive DNA hybridization methods. The company also notes that its device is sensitive to DNA levels as low as 2 picograms, well below the mandated max-

imum contamination level of 10 picograms that is typically the detection limit of the other methods.

The device makes use of a biosensor. A biological reaction is initiated on the surface of a silicon chip, the rate of change in potential that occurs during the reaction indicates the reaction rate and gives measure of the amount of reactants (in this case DNA contaminants) originally present. The entire threshold system includes a semi-automated workstation, a reader containing the biosensor unit, an instrument control terminal, and software for data collection, analysis, and report generation, it sells for \$28,000. (*Chem Wk.*, 2/1/89, p. 15)

BIOTECH FIELD TEST

West Germany's first experiment with a genetically altered plant is due to begin in May with the planting out of 37,000 manipulated petunias carrying a so-called "springing gene" which

changes the colour of the blossom. Although the project has not yet been officially approved by the Federal Health Authority, the BGA, it has received the seal of approval of the Central Commission on Biological Safety (ZKB), the scientific body that advises the federal government on the safety of genetic engineering projects.

A parliamentary committee studying the "prospects and risks of genetic engineering" in early 1987, recommended a five-year moratorium on experiments with genetically altered microorganisms or plants outside the laboratory; an informal ban that has been unheld by science and industry in the absence of a framework law.

However the federal health ministry has indicated that exceptions will be allowed. A spokesman for the BGA termed the experiment "low risk". The health authority generally follows the recommendations of the federal commission.

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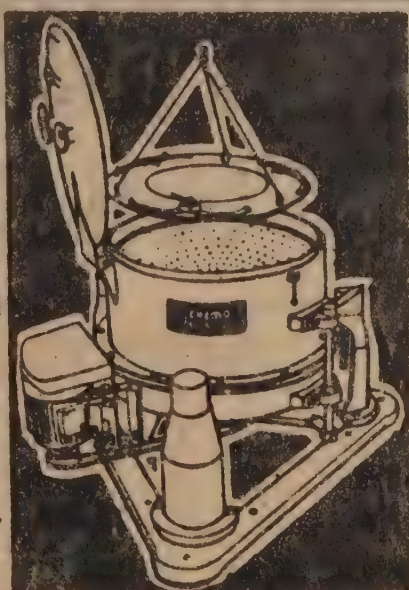
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Scope for downstream industries in Kerala based on Phenol and Acetone*

GIRISH RAJE

Chief Manager (Technical Services), Hindustan Organic Chemicals Ltd.,
P.O. Ambalamugal 682 302, Cochin, Kerala

During the last few years the State of Kerala is witnessing an increasing level of activity in the petrochemical field. With the commissioning of Hindustan Organic Chemicals' Phenol/Acetone complex at Ambalamugal, Cochin, Kerala has established its identity in the petrochemical map of the country. There is more to come with the commissioning of the caprolactum unit of FACT and Aromatics unit of Cochin Refineries Ltd. (CRL).

Our Cochin unit started commercial production only recently. This unit manufactures phenol and acetone and has an installed capacity of 40,000 TPA phenol and 24,000 TPA acetone. The total capital outlay for this grassroot complex is around Rs. 80 crores. The technology supplied by M/s. Universal Oil Products, USA incorporates the state-of-the art in phenol/acetone manufacture. Both the products, viz phenol and acetone have met the international quality standards and are sold in the international market. The major advantage of this unit is the close proximity of the raw material source, viz, propylene already being recovered by us from liquified petroleum gas supplied by CRL and benzene which will be available soon from the same source.

A brief outline of the process adopted by us for the manufacture of phenol and acetone will be useful in this context. One of the major raw materials for the phenol/acetone manufacture, viz. propylene, is recovered by us from the cracker off gases (LPG) supplied to us through a pipeline from CRL. The propylene recovery unit of HOCL has an installed capacity of 29,000 TPA propylene. This unit can produce both lean propylene, suitable for phenol manufacture, and chemical grade propylene, useful for manufacture of propylene derivatives. The LPG stream after propylene recovery is returned to CRL. In the first stage of phenol manufacture, propylene is reacted with benzene in a fixed bed catalytic reactor to produce isopropyl benzene (cumene). Cumene is then purified to the desired purity by fractionation. This cumene is then oxidised with air to cumene hydroperoxide in two bubble column reactors. Cumene hydroperoxide after oxidation is stripped off excess cumene and concentrated to about 80% strength in wiped film evaporators. Cleavage of concentrated cumene hydroperoxide to phenol and acetone is carried out

in circulated tubular reactors with a small amount of concentrated sulfuric acid catalyst. The excess acid is neutralised and phenol and acetone is purified in a series of six fractionating towers. A novel feature of the process is the excellent design of reactors which reduces by-product formation and thereby gives excellent yields of phenol and acetone. Since the manufacture of phenol from cumene process involves the handling of several potentially hazardous materials, many unique safety features have been incorporated in our plants.

In today's talk, I would like to give an overview of the various downstream industries that can be based on our products, viz. phenol and acetone. Though some of these products have been discussed at length at various forums, I feel that this area merits more detailed attention as both phenol and acetone are versatile organic chemicals and a variety of products can be manufactured based on them.

PHENOL BASED DERIVATIVES

Table I gives the complete spectrum of phenol based derivatives. I shall try to touch upon only some of the major products and the scope of setting up industries based on them.

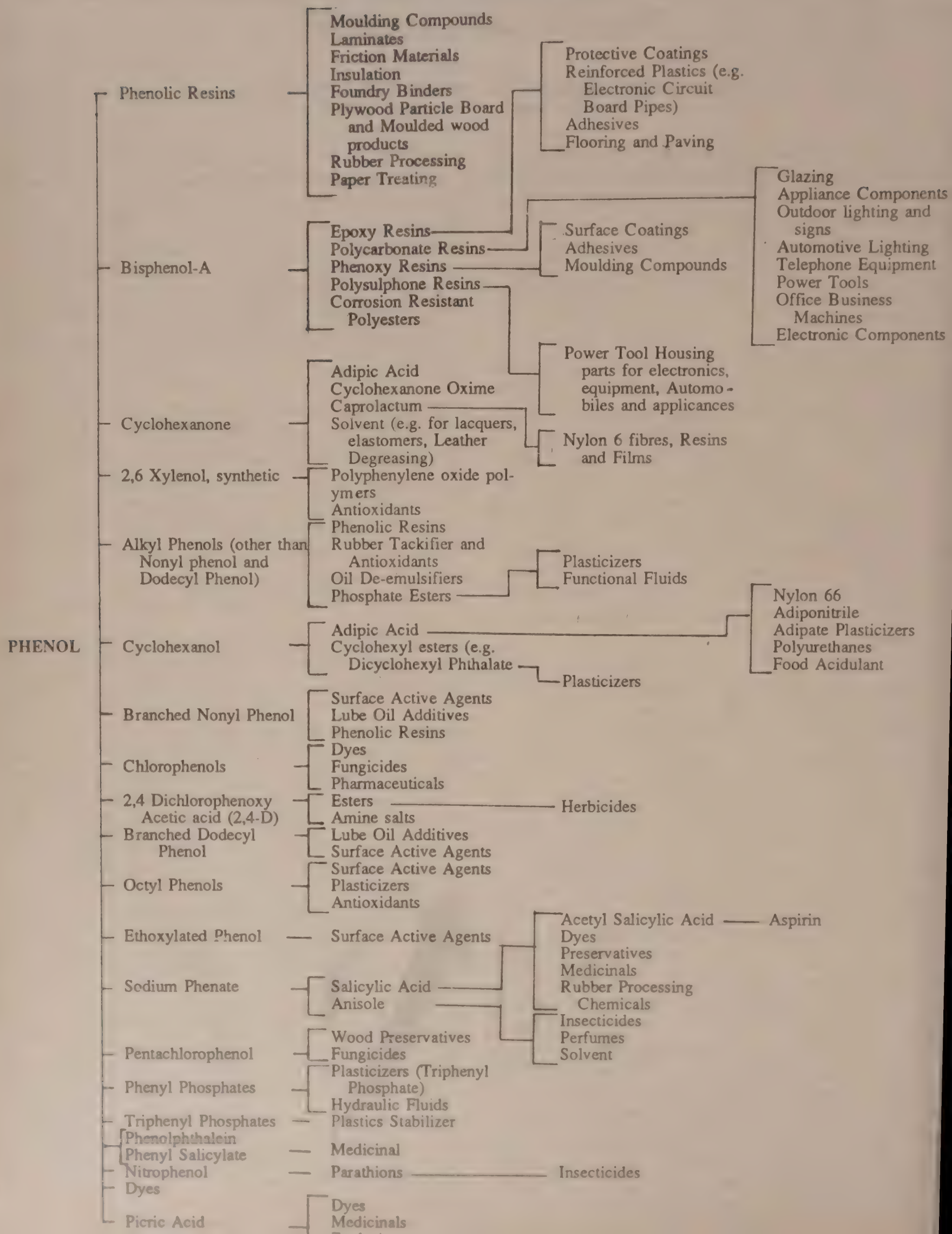
Phenol Formaldehyde Resins

The reaction product of phenol and formaldehyde has been in wide use and is the first thermosetting resin to be commercialised. These resins because of their tough, durable, wear resistant nature and di-electric properties are used as moulding powders, laminates, adhesives and coating resins.

Moulding Resins: Phenolic moulding resins are in powder form mixed with additives and are moulded into a number of products such as telephone housings and electrical components.

Laminates: These are produced by impregnating materials such as paper, cloth, wood, glass fibres, asbestos etc. With a solution of phenolic resin and by application of heat and pressure, curing the resin and bonding the base material, these laminates find extensive use in the electrical industry, in panel boards, table and counter tops, wall panels, boat hulls, aeroplane parts, luggage making materials, brake linings and many such other applications.

Table-I
PHENOL DERIVATIVES



Adhesives: Wherever a strong, durable and water-resistant bond is required, phenolic adhesives can be used. The greatest use is in the manufacture of marine or water resistant plywoods which is not possible with, say, urea formaldehyde resins. Besides, phenol formaldehyde adhesives are used in the manufacture of abrasive wheels and belts, insulation, brake linings etc.

Coatings: Due to the excellent resistance to heat and chemicals, phenolic resins are widely used in protective coatings. Baked phenolic coatings are used for tank linings. Phenolic resins are useful in many varnish, enamel and lacquer formulations.

In our country the phenolic resin industry is well established. Recently, phenolic foams have been introduced in the country as an insulating medium and is claimed to be fire resistant. The phenol formaldehyde industry which includes moulding powders, laminates, adhesives and coatings has been showing an average growth rate of 6-8% in the last few years. There are a few grades of foundry resins and adhesives which are still being imported into the country. A detailed study of the present status of the phenolic resin industry in our country has to be made. A comparative study of the resins available in the country and abroad will throw more light on the newer grade of resins which are being introduced abroad. Technologies based on continuous process instead of the traditional batch process and newer grades of resins with superior properties are available. These aspects need further exploration. Setting up of an industry in the small scale sector should include cost of effluent treatment facilities also as waste aqueous streams from these units are bound to contain phenol.

Bisphenol-A, Epoxy Resins, Polycarbonate, Polysulphone Resins

I would like to include all these products together as Bisphenol-A is a common raw material for epoxies, polycarbonate and polysulphone resins. Bisphenol-A is an ideal phenol/acetone derivative as both phenol and acetone are required for its manufacture. The demand for epoxy resins is bound to show a positive growth from the present figure of about 2500 TPA. As Bisphenol-A is a major raw material for epoxies, the demand for Bisphenol-A is also bound to grow from 2000 TPA to about 5000 TPA in the next five years. Polycarbonate resins based on Bisphenol-A and phosphoric acid will be introduced in the country in the near future. Polysulphone resin based on Bisphenol-A and dichlorodiphenyl sulphide is a high temperature resistant plastic widely used abroad. Besides, Bisphenol-A is used for the manufacture of polyester resins and as an additive for PVC resins. Bisphenol-A would be an ideal project that can be put up in the state of Kerala due to the close proximity to both the

raw materials viz. phenol and acetone from HOC. Bisphenol-A technology has shown a change from traditional sulphuric acid and hydrochloric acid based catalysts to ion-exchange catalysts. However, technology availability for low capacity plants may be a constraint. The capacity to be installed has to be based on potential growth of both the epoxy and polycarbonate resins and minimum economically viable capacity has to be ascertained. This area deserves immediate attention. A combined Bisphenol-A, epoxy resins unit may be a more viable proposition.

Chlorophenols

Chlorination of phenol results in useful derivatives such as 2,4-dichlorophenol which is an intermediate for 2,4-dichloro-phenoxyacetic acid (2,4-D), a herbicide widely used. With loop reactors, excellent yields of 2,4-dichlorophenol is achieved in short residence time compared to batch process. The present status of the industry needs a fresh look. Other isomers, tri and pentachlorophenols have also commercial uses.

Salicylic Acid

We have an industry in our state manufacturing salicylic acid from phenol. Other than for the manufacture of aspirin, salicylic acid is also used in dyes, preservatives, medicinals and rubber processing chemicals. It is felt that there is scope for growth in this area.

Alkyl Phenols

These products are widely used in lube oil additives, plasticizers, as surfactants and in modified phenolic resins. Presently it seems there is not much scope in these products as enough capacity has been installed and letters of intent have been issued for additional capacities. The growth of this industry has to be watched carefully to explore the scope of these phenol derivatives.

Triphenyl Phosphate

Triphenyl phosphate, tricresyl phosphate etc. are used as plasticizers. Triphenyl phosphate is used in the photographic film industry. The product has to meet strict quality specifications due to its speciality application. New process routes are now available based on ambient temperature process conditions which give better quality and yield of the product instead of the conventional high temperature process. A detailed study of the demand for these plasticizers in the country is required.

Xylenols

These are presently available in the country from the phenolic fraction in coal tar. 2,6-xylenol synthetically made

from phenol has commercial applications abroad in antioxidants and plastics based on polyphenylene oxide resins. This area needs further study.

Cyclohexanol/Cyclohexanone/Adipic Acid/Caprolactum

These products can be obtained from phenol. Presently cyclohexanone is imported into the country. However, with the commissioning of caprolactum units already under installation in the country, it may be possible to meet the demand of cyclohexanone.

Supply position of phenol and industry-wise demand projections for phenol are given in Table-II.

Table-II

PHENOL: INSTALLED CAPACITIES AND DEMAND PROJECTIONS

Licenced/Installed Capacities (TPA)

Herdillia	19,050
HOCL	40,000
Neyveli	1,000
Total	60,050

Demand Projections (TPA)

Sector	1989-90	1994-95	99-2000
PF Resins	21,685	28,910	39,150
Pharmaceuticals	5,265	7,660	11,170
Wire Enamels	1,640	2,195	2,935
Epoxies	1,770	2,600	3,820
Lubes	1,010	1,350	1,800
Synthetic Tanning Agents	1,010	1,350	1,800
Pesticides	1,075	1,440	1,925
Dyes	645	785	955
Rubber Chemicals	570	760	1,020
Alkyl Phenols	4,000	6,500	9,000
Cyclohexanol/Hexanone	--	12,000	15,000
Miscellaneous	2,020	2,700	3,610
Total	40,690	68,250	92,185

ACETONE BASED INDUSTRIES

Acetone is a co-product of the cumene-phenol process. For every part of phenol produced, 0.6 parts of acetone is generated. With acetone available in plenty in the country acetone derivatives gain increasing significance. Table-III gives the entire spectrum of acetone derivatives. I shall review some of them.

Diacetone Alcohol

This is a solvent widely used for surface coatings and allied industries and as a high boiling solvent in many applications.

This can be manufactured by condensation of acetone and is already manufactured in our country. Hydrogenation of diacetone alcohol gives hexylene glycol which has also commercial uses.

Methyl Isobutyl Ketone (MIBK)

This is a versatile solvent in paint and lacquer industry and also in pharmaceutical preparations. MIBK is being manufactured in the country at present and a supply/demand position has to be examined to work out the feasibility of putting up any new units.

Acrylates from Acetone

The manufacture of methacrylate esters and acrylic polymers from acetone has been established in the country a few years ago. Since hydrogen cyanide is involved in the manufacture, close proximity to the raw material source is essential. Handling of HCN due to its hazardous nature limits the feasibility of this project close to the source of the raw material (HCN) availability. Acrylic acid esters can be manufactured from acetone via ketene route.

Bisphenol-A

This product has already been discussed under phenol based products.

Isophorone

This is an important acetone derivative. Letter of Intent has already been issued for a 500 TPA unit. This is widely used as a solvent for polyvinyl and nitrocellulose resins, pesticides and stoving lacquers. Isocyanates based on isophorone are widely used in polyurethane systems.

Acetic Anhydride

Acetic anhydride can be manufactured from acetone commercially via the ketene route. Diketenes from ketene can be converted to a variety of pharmaceutical intermediates also. With the free availability of acetone in the country, manufacture of these products from acetone instead of acetic acid must be pioneered. A detailed study of the techno-economic aspects of this route should be made.

Supply position of acetone and industry-wise demand projections for acetone are given in Table-IV.

USEFUL PRODUCTS FROM BY-PRODUCTS OF PHENOL/ACETONE PROCESS

During the manufacture of phenol by the cumene route some by-products such as heavy aromatics and tar are obtained. These are presently used as fuels. It is possible

Table-III
ACETONE DERIVATIVES

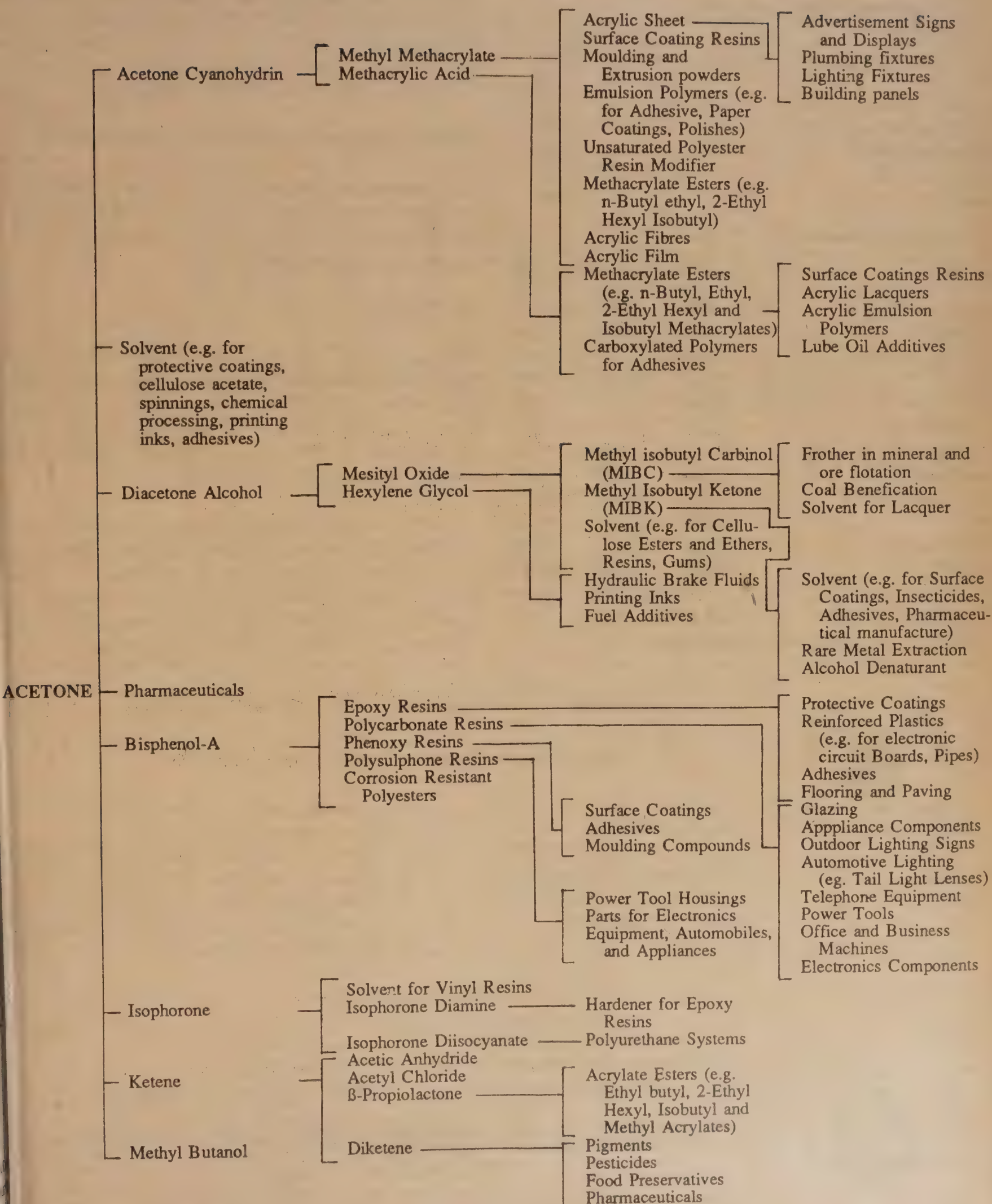


Table-IV
ACETONE: INSTALLED CAPACITIES AND
DEMAND PROJECTIONS

Licenced/Installed Capacities (TPA)

Herdillia	11,400
NOCIL	14,000
Sirsilk	1,500
Walwa Sahakari	4,500
Krishna Sahakari	3,000
Chetana Sahakari	3,000
HOCL	24,600
Total	62,000

Demand Projections (TPA)

Sector	1989-90	1994-95	99-2000
Pharmaceuticals	5,865	7,990	11,050
Pesticides	690	940	1,300
Cellulose Acetate	3,450	4,700	6,500
Acrylics	4,140	5,640	7,800
Oxy-acetylene gas	2,760	3,760	5,200
Rubber Chemicals	1,035	1,410	1,950
Surface coatings/paints	2,415	3,290	4,550
Explosives	345	470	650
Diacetone Alcohol	5,520	7,520	10,400
MIBK	4,830	6,580	9,100
Miscellaneous	3,450	4,700	6,500
Total	34,500	47,000	65,000

manufacture or recover some commercial products from them; a few of which are discussed below.

Resorcinol from Heavy Aromatics

During the manufacture of cumene (isopropyl benzene) which is the intermediate in the phenol process, substantial amounts of di-isopropyl benzene are formed. It should be possible to separate and convert the meta isomer into a useful product like resorcinol. Sumitomo Chemicals of Japan has developed a commercial process based on this.

Acetophenone, p-Cumyl Phenol from Phenolic Tar

The tar obtained in the phenol process contains compounds like acetophenone, p-cumyl phenol etc. which have commercial applications. Studies on the economies of recovery of these products can be taken up.

CONCLUSION

To sum up, the phenol/acetone complex of Hindustan Organic Chemicals at Ambalamugal, Cochin, provides ample scope for diversification based on the two vital raw materials, viz. phenol and acetone. However, some of these projects may have to be set up in the small scale sector while some require substantial investments.

A detailed study of the demand/supply position of the various products and the present status of implementation of the LOIs issued for various products discussed has to be taken up on top priority. Sustained efforts from the various agencies involved in the growth of the chemical industry in Kerala is required to see some of these ideas taking shape.



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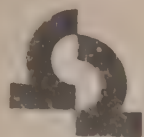
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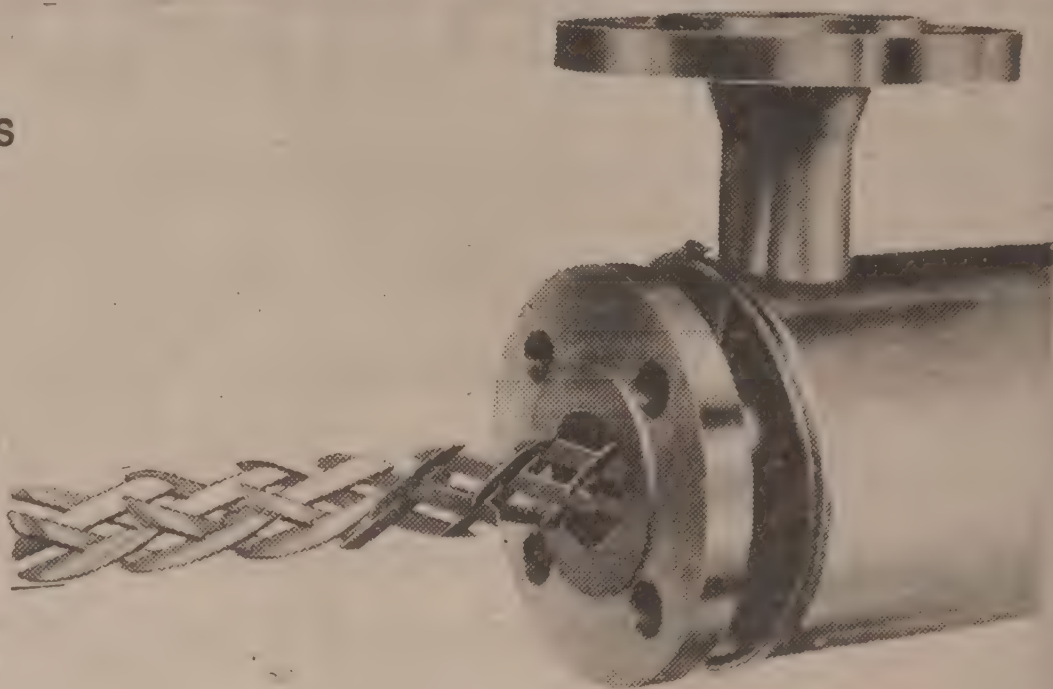
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Problems of project identification

N.S. VENKATARAMAN

Chief Consultant, Nandini Consultancy Centre, Madras.

The frequent appearance of advertisements in newspapers seeking information on project opportunities in chemical industries only indicate the problems faced by the investors in the country, in identifying suitable projects for implementation. Such advertisements are given not only by individuals, but also by large organisations with well equipped corporate and project planning divisions. The lack of organised and reliable informations in the country on project opportunities is very much evident. Though the state industrial development organisations and central industrial promotional bodies have the objective of providing and maintaining adequate and reliable information on industrial growth in the country, they seem to be of little use to the investors, particularly in the field of chemical industries.

We find a number of cases, where one financing institution of a state rejects a project proposal, which is accepted for financial assistance by another institution in a different state. Whereas in the case of medium and large units, some sort of information can be traced out with difficulties, the situation is really chaotic in the case of small scale industries, where no centralised source of information are available at all. In such circumstances, the investors have to spend considerable time and money in assessing the demand potentials for the individual chemical products. The growth of chemical industries in the country can certainly be made more healthy and faster, if only it can be ensured that organised, upto date and reliable information are made available to the investors on a continuing basis.

Given the lethargic and uncommitted ways in which the several government departments function, it would not be safe to rely on the governmental agencies to make such informations available to the investors, without delay and cumbersome procedures. To assess the investment opportunities, not only vital data should be collected but they also have to be studied in a systematic and scientific manner. Perhaps, such jobs can be done only by good and specialised consultancy organisations in chemical industries. There do not seem to be many consultancy organisations in the country with adequate background, expertise and resources to mobilise and assimilate data, for rendering proper advice to the investors. Even committed and genuine consultants find it difficult to render quality services in this field, due to the paucity of funds and the general reluctance of the investors and industrial managements to pay adequately to the consultants for the services rendered. The net loser appears to be the nation and its industrial growth. There is a lot of confusion on the national scene with regard to the decisions on setting up of chemical industries and the average investor remains per-

plexed and confused. For example, the confusion prevailing with regard to the determination of minimum economic capacity level for chemical industries by the government is very much evident. The government is frequently changing its stand, which is obviously due to lack of data before it. In a growing economic and industrial environment, without a scientific approach, no worthwhile decisions would be possible. It is unfortunate that there appears to be no systematic efforts on the part of the government or leading industrial groups to develop and encourage such integrated expertise for identification of project opportunities in chemical industries.

Even good consultants find it extremely difficult to assess the demand potentials for chemical products and recommend the creation of additional capacities. The official statistics from DGTD and other government agencies regarding the production of chemical products and import-export data are released after one or two years, by which period such data become obsolete and irrelevant. There is tremendous reluctance on the part of the Indian industries (small, medium and large) to provide information on production and demand figures, when such information are sought by the consultants. When letters are sent seeking such information, most of the companies do not care to reply at all. Often such vital informations has to be collected by the consultants in a clandestine and even unethical manner.

It is high time that the government recognises the importance of consultancy organisations, specialising in market research for chemical products and provide them with some sort of assistance or subsidy to equip themselves with facilities to gather and store vital information. Even the financing institutions, in the centre and the states, should insist that market survey reports should be made by recognised consultancy organisations. Without such proper policies, the confusion in the Indian chemical industrial environment with regard to the creation of additional capacities for individual chemical products would go on unchecked.

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Science Briefs

FOOD DYES CORRODE COPPER

Recent findings by Indian scientists indicate that aqueous solutions of food dyes can cause corrosion of copper -- a fact which must be borne in mind while preparing artificial food colours.

The amount of copper in food articles ranges from 20 parts per million (ppm) in beverages to 100 ppm in tomato juice. Although copper is considered to be quite resistant to attack by most food items, it may corrode in the presence of oxygen or an oxidising agent. In such cases, the product may pick up enough copper to affect the colour or taste and give rise to off-flavours.

Scientists at Shri U.P. Arts, Smt. M.G. Panchal Science and Shri V.I. Shah Commerce College, Pilvai, studied the corrosion of electrolytic copper by various food dyes like ponceau 4R, tartrazine, amaranth, carmoisine, sunset yellow, fast red E, indigo carmine and erythrosine. They also studied the effects of additives like mango essence and sorbitol, or preservatives like sodium benzoate and potassium metabisulphate, on copper corrosion.

During their experiments, the researchers exposed test specimens of copper -- rectangular copper plates of size 50 x 30 x 0.7 mm, containing more than 99 per cent copper and minute amounts of nickel, iron, lead and silver -- to solutions of food colourants. They immersed the specimens suspended by a glass hook into individual beakers containing the food dye solution or additive under test. The apparatus was left exposed to air for three days. After the test, the specimens were cleaned with 5 per cent sulphuric acid.

Reporting their findings in the Indian Journal of Technology, scientists J.D. Talati and A.S. Patel said very dilute (less than or equal to 0.01 per cent) solutions of the colourants were only mildly

corrosive. However, a definite change in colour was observed in solutions containing ponceau 4R, amaranth, carmoisine and fast red E, which turned orange from yellow. Sunset yellow also changed to deep orange. But indigo carmine and erythrosine did not show any colour change.

In all cases except indigo carmine and erythrosine, the extent of corrosion rose with increasing concentration of the colours. While carmoisine was the most corrosive of all colourants erythrosine was the least. The scientists also attempted to study the effects of various food acids containing about 0.025 per cent of the colourant on copper. Acetic acid was found to be the most corrosive, followed by citric acid, lactic acid, malic acid and tartaric acid.

Another significant finding is that ponceau 4R, which itself is very corrosive, becomes less corrosive in the presence of additives, whereas erythrosine, which is the least corrosive of all colouring agents, becomes the most corrosive in the presence of additives.

The scientists suggest that the lower corrosivity of erythrosine may be due to its chemical structure which differs from that of all other dyes in the presence of functional iodide groups and absence of sulphonic groups. The corrosivity of the other dyes may be traced to the presence of two or more sulphonic acid groups, the report says, adding that the difference in corrosiveness of the dyes may be traced to the slight differences in their structures or the positions of sulphonic acid groups in the molecule.

-- PTI Science Service

RADIATION-RESISTANT PAINTS FOR NUCLEAR POWER STATIONS

Indian scientists have developed radiation- and corrosion- resistant paints

for protection of steel, concrete and other non-ferrous surfaces in nuclear power plants and marine environments.

The most important properties for paint coatings in nuclear engineering facilities are resistance to radiation, low contamination by contact with the radionuclides, good decontaminability, high chemical and physical stability, low swelling and good corrosion protection.

Nuclear engineering facilities where paint coatings have to be frequently applied are steel constructions, concrete walls, machine parts, tunnels and floors belonging to nuclear power plants, research reactors, high energy-particle accelerators and isotope laboratories.

The new complete paint system developed by researchers at the Central Electrochemical Research Institute, Karaikudi, consists of three paints -- primer coat, under coat and finish -- reports "Invention Intelligence". The primer is a two-pack system; one pack contains zinc metal powder as pigment and the other pack contains sodium silicate solution as binder.

The contents of the two packs are mixed before use. The metal powder is slowly added to the binder while constantly stirring, and mixed thoroughly to ensure uniform dispersal. The paint so prepared can be applied either by spraying or with the help of a brush, on a sand-blasted substrate. The primer protects the metal substrate by galvanic action and by forming a protective barrier.

For the under coat and finish coat epoxy resin is used as a binder and polyamide as a curing agent. Rutile titanium dioxide and other extenders are used for pigments. The paint is prepared by mixing the binder, pigment and other additives in a jar and then grinding till the desired firmness is achieved. The curing agent is added at the time of preparation of the paint.

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(KNS-ADI)

Studies by the CECRI scientists showed that the paint system was resistant to most chemicals or solvents, including nitric acid, sodium chloride, sodium hydroxide, teepol, hot water and petrol.

The coatings were found to be resistant to UV radiation, changes in the weather, sea water and high-energy radiation. "The paint system was found to possess excellent radiation resistance and passed all the decontamination tests", during tests conducted at the Bhabha Atomic Research Centre, Bombay, CECRI scientists S. Guruviah and co-workers said in the report.

The researchers, S. Guruviah, M. Sundaram, V. Chandrasekharan, P. Jayakrishnan, R. Raghupati and V. Ganesa Sarma, have been jointly awarded Rs. 5,000 by the National Research Development Corporation for this development.

-- PTI Science Service

NEW FIRE-RETARDANT FOR NATURAL RUBBER

The Regional Research Laboratory (RRL) Trivandrum, has developed a new fire retardant natural rubber which the scientists say is the best of its kind produced so far. The RRL scientists developed the new fire retardant rubber using a synergistic combination of antimony oxide and ANORIN 44, a phosphorous and halogen containing prepolymer obtained from cashew nut shell liquid (CNSL). The compositions, for which a patent has been filed, have been found to be self-extinguishing in vertical burning tests, and have a high limiting oxygen index (LOI) a measure of fire retardance) of 42. This is the highest ever reported value for a natural rubber, says a CSIR news letter.

The flammability characteristics and mechanical properties of a typical fire retardant natural rubber composition have been found to include a self-extinction time of 0.5 to 1 second; 1.085

per cent weight loss on burning; LOI of 42; tensile strength of 224.06 Newtons per square centimetre; and 400 per cent elongation at break.

The formulations have been found to be easily processable on a roll mill and can be moulded into desired shapes to enhance commercial appeal. ANORIN 44 is prepared from ANORIN 38 -- a phosphorous-containing prepolymer developed from CNSL -- the technology for which is being jointly released by RRL, Trivandrum, and Vikram Sarabhai Space Centre, Trivandrum.

ANORIN 38 and ANORIN 44, which are based on CNSL obtained from the cashew nut tree (*Anacardium occidentale*), are very cost-effective compared to other phosphorous and bromine-based fire retardants available in the international market. The presence of both hydrophobic hydrocarbon side chain and the hydrophilic polar groups in the same molecule makes these resins compatible with a wide range of plastics and elastomers.

ANORIN 38 has already been found to provide adequate fire retardancy to polyurethane polymers and thermoplastics. The problem of generation of smoke due to the presence of halogen can be easily overcome by incorporating a smoke-suppressant like boric acid which itself is a fire retardant.

-- PTI Science Service

RESERVATIONS ABOUT COLD FUSION

Scientists at Harwell, the world's leading nuclear laboratory, have finally buried hopes that "cold fusion" is the key to solving mankind's energy problems. Dr. David Williams, head of the Oxfordshire team which has carried out painstaking checks on the method, said: "We have spotted neither heat nor radiation".

The verdict is regarded as decisive because the checks were carried out

with the help of Professor Martin Fleischmann, who, together with his former student Mr. Stanley Pons, made the original claims six weeks ago. The two scientists told a press conference in Utah that using their "test-tube" method, a gallon of seawater could produce as much energy as 300,000 gallons of petrol without contributing to the greenhouse effect, acid rain or producing radioactive waste.

It now appears that no more energy is given out from the table-top apparatus -- based on electrochemical cells -- than is put into it. One possibility is that the original experiment was distorted by background levels of gases and radioactivity. Another is that the two scientists were misled by faulty instruments.

Dr. Williams, who expressed reservations from the start, said: "We believe we have duplicated the experiments of Prof. Fleischmann and Mr. Pons, but using much more sensitive equipment. Given the numbers we had been told to expect, we should have seen something leap out at us by now. This has not happened."

Prof. Fleischmann of Southampton University, and Mr. Pons stunned the world with the announcement that they had found a way to tap nuclear fusion -- the process that powers the sun and hydrogen bombs. Teams of scientists from laboratories rushed to copy the experiments. Many, like Georgia Institute of Technology, reported success, then withdrew their claims. The most favourable experimental results came from Stanford University in California.

Since then doubts have grown, culminating in a meeting of the American Physical Society recently, which judged the claims unsupportable. "I think they are clearly on the ropes at the point", physicist Steven Koonin of the California Institute of Technology Pasadena said on May 10, after the presentation by Mr. Martin Fleischmann and Mr. B. Stanley Pons.

However, Mr. Koonin said the possible achievement of room-temperature fusion in an experiment by Mr. Steven Jones of the Brigham Young University, who has made much more modest claims about the implications of his findings, "is looking pretty good and there may be some real physics there".

However, the pair were undeterred and insisted they were pushed into premature disclosure of their experiments by fears of leaked information and rival teams.

Admits failure

Dr. Martin Fleischmann admitted in Los Angeles that a key result of the experiment by him and his American colleague, B. Stanely Pons of the University of Utah, which they had taken as a sign of fusion, was in error.

However, Fleischmann insisted that they had achieved cold fusion. Fleischmann said that the two were now staking their claim of success on a new experiment designed to overcome the shortcomings of the defective earlier one.

Indian scientists struck by cold fusion fever

Indian scientists, like their colleagues in the rest of the world, have been struck by the cold fusion fever. The excitement is almost palpable and understandably so. Reasons are simple: cold fusion, if made possible, will eventually lead to a cheap and virtually inexhaustible source of energy.

The scientists of the Variable Energy Cyclotron Centre (VECC), Salt Lake, research wing of the Bhabha Atomic Research Centre, called a press conference in Calcutta recently to announce that they too have achieved cold fusion results, in their experiments, which are comparable to the results announced by the two US scientists, B. Stanley Pons and Martin Fleischmann, whose experiments have generated all the heat and fusion in the world scientific com-

munity leading to claims and counter-claims.

Indian scientists are, therefore, playing it extremely safe before claiming any major success. Dr. Bikash Sinha, director, VECC, said that the "whole scientific community is oscillating between doubts and jubilation. If successful, we are on the threshold of a revolution which will change our entire life. We are constantly checking and rechecking to make it foolproof, but at the same time we know that we are onto something". But beneath the scientific caution in Dr. Sinha's carefully guarded official statements one can detect the excitement which clearly conveys that the Indian scientific community are on the verge of a breakthrough. "But it is better to keep our fingers crossed."

Explaining the details of cold fusion experiments carried on at VECC, he said, a set of palladium (cathode) and a platinum (anode) electrodes were inserted in a 25 mm by 25 mm cell filled with heavy water and connected with only a four milliamperes battery. The whole contraption was fitted with a neutron monitoring counter. Electric current from the battery was passed through the electrodes and after seven hours of constant charging it was found that at 53 degree Centigrade temperature there was a sudden burst of excessive neutron flow from the electrodes for about 10 minutes. Again after three hours there was a similar burst of neutrons at 53 degrees Centigrade. It is this entire reaction which gives off the tremendous heat energy.

However, the basic issue confronting scientists is a possibility of a burst of neutrons emanating from cosmic rays from the atmosphere interfering with the experiments and accounting for the excessive neutron count. Scientists at VECC are carrying out a series of controlled experiments to find out whether their neutron counts were affected by cosmic rays. If these experiments prove that the neutron flow came from the

electrolysis process and not due to any cosmic interference, the breakthrough will be achieved beyond any further doubt.

But once again Dr. Sinha is cautious as he points out: "It will still be a far cry to produce fusion power at low energy. But no doubt a beginning will be made. We do not want the media to take our achievements to the heights of exotica one day, then kill it the next day and resurrect it again. Science does not function that way at all. We would like to study the phenomena in greater detail before making any claim of having found the answers to cold fusion."

UNDERGROUND FUSION TO PRODUCE HELIUM

Evidence of possible occurrence of nuclear fusion some 50 km down the earth has been obtained by the scientists at the Bhabha Atomic Research Centre (BARC) in Calcutta. The Centre's Director, Dr. Bikash Sinha, told presspersons that they had drawn this inference during a three-week exploratory survey of the hot springs at Bakreshwar in West Bengal's Birbhum district and at Tantloi village in Bihar's Santhal Parganas district recently when helium gas spued out in abundance.

This abundance of helium gas (Three), he said, was a pointer to the occurrence of such fusion at the earth's bowels where 'neutron bursting' resulted in the lighter helium gas exerting pressure to find an outlet through the hot springs.

The survey, conducted 30 years after the one made by the scientist, Dr. Shyamadas Chatterjee, in the Bakreshwar hot springs, has also thrown light on the possibility of alpha particles reacting with the chlorine contained in the water to produce helium gas (Three), Dr. Sinha said. "It may be a possible source of so-called cold fusion below the earth. Experts are required to find out if helium gas comes out due to natural

conditions made billions of years ago", the Centre's Director said, adding that the time had come to exploit the massive potential of helium gas.

The nuclear scientists, he said, had excavated 1,000 sq. ft. area at the hot spring at Tantloi village to locate huge reserves of helium gas. "It is still debatable if helium (Four) gas, found in the area, is forced out due to radioactivity. However, our hypothesis is that some kind of fusion is going on inside the earth to produce both helium (Three and Four) gas".

Dr. Sinha said the BARC scientists had "successfully" carried out an experiment similar to the one made by two foreign scientists to find a three to four-fold increase in the number of neutrons over the normal atmospheric background. The experiment, he said, was rather similar to the so-called "cold fusion" test being carried out.

RANBAXY RESEARCH AWARDS PRESENTED

The 1987 research awards, instituted by Ranbaxy Laboratories Ltd., to commemorate its silver jubilee, were presented to four scientists by the Lok Sabha speaker, Dr. Balram Jakhar, at a function in New Delhi on May 11. The awardees, two each in medical and pharmaceutical sciences, were selected

by a panel of judges headed by Prof. M.G.K. Menon, Member, Planning Commission. The awards are given to Indian scientists in the country and abroad for excellence in research. The award includes a cash price of Rs. 50,000 each.

In medical sciences, Prof. B.N. Dhawan, Director, Central Drug Research Institute, Lucknow, received the award for his pioneering studies on the role of biogenic amines in regulating CNS activity and demonstration of the receptor types involved.

Dr. M.R. Das of the Centre for Cellular and Molecular Biology, Hyderabad, received the same award for sustained contributions in the study of molecular basis of malignant transformation, especially on correlates of oncogene expression in chemically induced cancer.

In the pharmaceutical field, Dr. A.V. Rama Rao of the Regional Research Laboratory, Hyderabad, was given the award for his outstanding contributions to pharmaceutical chemistry which include the total synthesis of antitumour antibiotics, macrolides, synthesis of ionophores and chiral synthesis of biologically active compounds. The second award in the field was presented to Prof. Harkishan Singh of Punjab University, Chandigarh, for his research in synthe-

tic medicinal chemistry, especially in the design of biologically active heterosteroids.

CFTRI REPORT ON BANANA PROCESSING

The Central Food Technological Research Institute, Mysore, has just published a monograph entitled "BANANA IN INDIA -- Production, Preservation, Processing". This industrial monograph contains information on production, propagation, cultivars, harvesting, yield, chemical composition and post-harvest technologies for handling, transportation, storage, ripening, marketing and export. The processed products covered include banana pulp, fig, liquid fruit, juice concentrate, toffee, deep fat fried chips, powder, fruit bar, squash and brandy. Brief notes on physiological disorders and suggestions to minimise losses in marketing channels add further to the usefulness of the publication. Price Rs. 30 + VPP charges.

Other useful monographs brought out by CFTRI are (1) Pineapple: An Industrial Profile (Rs. 15); (2) Pepper: a profile (Rs. 15); (3) Papaya in India (Rs. 20); (4) Grapes in India (Rs. 20). Two more monographs viz. (1) Orange in India and (2) Mango: an Industrial profile, are expected to be released shortly. For copies, please write to the Sales & Distribution Officer, FOSTIS, CFTRI, Mysore-570 013.

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NEWS FROM JAPAN

Japan's Ethylene Cap. To Hit 6.3 Million By End of '91.

Japan's combined annual production capacity for ethylene will reach 6.3 million tons plus or minus 200,000 tons by end of 1991 as a result of debottlenecking of existing ethylene plants. It stood at a little over 5 million tons last summer and 5.8 million tons at the end of last year.

The aforementioned forecast was recently released by the Ministry of International Trade and Industry (MITI).

The supply-and-demand situation for ethylene has been tight throughout the world. Japanese producers are endeavoring to scale up their production capacity through debottlenecking of ethylene plants current in operation, resumption of operation of idled plants and scaling-up of naphtha crackers.

Japan's ethylene demand is continuing to increase in response to brisk domestic demand for petrochemical products. It amounted to 5.06 million tons in 1988, and is projected to reach 5.15 million tons in fiscal 1988 ending this March. No ethylene center company is able to completely meet the brisk demand it is facing despite full capacity operation of ethylene plants and skipping of regular repairs.

In the circumstances, a total of six projects for scaling up or building ethylene plants have been worked out by ethylene center companies.

According to MITI sponsored hearings involving all the ethylene center firms in Japan, the total volume of ethylene they will

need in 1993 reaches a surprisingly high level of 7.7 million tons. The volume, is, however, far from actual demand for ethylene derivatives. MITI will coordinate the six projects on the basis of demand forecasts for ethylene and its derivatives. Industrial Structure Council attached to MITI is scheduled to submit this June a report on implementation of six projects.

Asahi Chemical Aggressively Tackling MMA Resin Business

Asahi Chemical Industry Co., has started expansion of its methyl methacrylate (MMA) resin business. The company is planning to increase MMA monomer production capacity at the Kawasaki factory (Kanagawa Prefecture) by about 17% to the 70,000-t/y level, investing about ¥500 million. Completion is scheduled for this autumn. On the other hand, a plants for extruded monomer sheet is now under expansion at the Fuji factory (Shizuoka Prefecture). The expanded plant is expected to start operation this summer on an annual production scale of 4,000 tons. Thus, the annual supply at the Fuji factory will total 18,400 tons, a 30% increase.

Asahi Chemical through-produces MMA from monomer to polymer. With regard to monomer, the company switched the manufacturing process from the acetoncyanhydrin (ACH) process to its in-house-developed methacrylonitrile (MAN) one in 1974 and established a production system with a 50,000-t/y scale. Later the monomer production facilities were upgraded by means of de-

bottlenecking at the time of periodical repairs. At present, the total production capacity concerned is 60,000 tons per annum.

Domestic demand and export of MMA monomer in the January-December period of 1988 recorded 12 and 29% growth, respectively. Asahi Chemical planned the expansion in response to these vigorous demand growths, and to ensure a stable supply for export.

On the other hand, domestic demand for extruded sheet showed a large increase of 13% last year. This was due chiefly to demand expansion for building materials for exterior ornaments and shop displays.

Chemical Data Base Service Starts for 1st Time in Japan.

Chemical Data Service Co. held on March 23 a party in Tokyo to celebrate the start-up of its business service — utilizing the "CDNET" system — for supplying information on Japan's chemical industry. About 600 guests attended the celebration for the inauguration of the service, the first of its kind in Japan.

At the opening of the party, President S. Matsuzaki of Chemical Data Service gave an address in which he said "We have been building a set-up for the supply of chemical-industry data since last year. Now it is a great pleasure to start this business thanks to the support of many people at government agencies and in private businesses. From now on we will continue efforts to improve our services and data supply systems".

Commenting on the new business, Director r. Tanahashi of the Machinery and Information Industries of Bureau of MITI will surge from the present ¥20 trillion to ¥140 trillion in the year 2000,

or 20% of the GNP. But Japanese data-base services in terms of software are quite behind those of the U.S. The start of CDNET service will thus be of great significance for both the chemical industry and information industry in Japan."

Vice-President T. Hijikata of Federation of Economic Organizations also spoke to the guests, saying: "In the present information-oriented society, it is of prime importance to offer promptly a great deal of necessary information. Much expectation should thus be placed on CDNET service."

At the party, data retrieval using CDNET was demonstrated and terminal equipment made by IBM Japan, ASD, Toshiba, Hitachi, NEC and Fujitsu, etc., was also displayed, absorbing the attention of the guests.

Construction of 250,000-t/y p-Xylene Plant Planned for '90.

Ukishima Aromatic Chemicals Co., wholly owned by Nippon Petrochemicals Co., plans to construct a 250,000-t/y P-xylene plant with completion scheduled for the end of 1990 or early 1991. Work on the plant is scheduled to be inaugurated this September.

Behind the construction of the new plant is the growing demand for high-purity terephthalic acid (PTA): p-xylene is raw material for PTA. The planned plant will be put into full capacity operation and the company will stop running an existing 200,000-t/y plant.

It is considering supplying domestic users with 200,000 tons a year of the product and exporting 50,000 tons a year of it to S. Korea and Taiwan. The new plant will be based mainly on the

Toray process and partially on the UOP process developed in the United States.

p-Xylene has been in short supply with realization of production expansion plans for PTA in the background. PTA demand is rapidly expanding in response to a sharp increase in demand for polyester fiber/resin.

PTA makers in S. Korea and Taiwan are increasingly calling on Japanese p-xylene producers to supply far larger amounts of the product but the latter's export capacity is limited. What is worse, it will shrink further from the end of this year thru the beginning of next when PTA plants will be built or scaled up in Japan.

Japanese p-xylene makers have hitherto scaled up production capacity through the debottlenecking of their plants. Like Ukishima Aromatic Chemical, a few p-xylene producers are also planning to further expand production facilities.

As Resin Demand in 1988 shows Negative Growth

According to Japan's acrylonitrile/styrene (AS) resin industry, demand for AS resin in 1988 (January-December) registered 80,313 tons, a 3% drop from the previous year. This negative growth is the first in the three years since 1985 and stems from the fact that demand for AS resin for use in ABS (captive use) (acrylonitrile/butadiene / styrene) resin increased due to the increase in production of the latter. Consequently, the export capacity of Japanese AS resin manufacturers dropping rapidly. Furthermore, AS resin for use in household electrical appliances and sundry goods hit the ceiling. Demand for AS resin in 1989 is ex-

pected to show a 1% rise over the previous year. However, demand for the product for use in vehicles expected to decrease. Competition between AS resin, and polypropylene (PP) resin and polystyrene (PS) resin is expected to be intensified.

Styrene-based resins such as PS and ABS showed favourable growth in 1988, but AS also a decrease from the previous year because, as mentioned above, exports decreased by as much as 32% from the preceding year. Main customer countries are Southeast Asian ones such as Hong Kong, China, Thailand and Malaysia.

1,4-Butanediol Demand Becoming Very Tight.

The supply-and-demand situation for 1,4-butanediol has become tighter and tighter this spring.

In addition to brisk demand for the product for urethane use, Southeast Asian countries are increasingly manufacturing polybutyrene terephthalate (PBT) by themselves. Consequently, demand for 1,4-butanediol has increased sharply and supplier countries including Japan have been receiving brisk inquiries for product.

In Japan, Europe, and America, it has been difficult to fulfill even domestic demand for 1,4-butanediol so that its supply has become all the more short and a product prices at \$2,000 per ton has appeared on an overseas market.

In Europe and America, trend of 1,4-butanediol products including derivatives such as THG, PTMEG, and NMP has continued to show a bullish tone. Since last prices has been raised several times.

New Developments from Japan

New 3-Dimensional Processing Tech. For Metallic Materials Developed

Matsushita Research Institute Tokyo, Inc. has developed a new technology for three-dimensional, micrographic processing of very thin metallic materials into gears, bearing and machinery parts with complicated forms, in the order of tens of a thousandth of a millimeter.

Matsushita Research Institute is going to market this new technology by the coming fall. The company is already known for establishing the technology capable of miniscule perforation and boring, which stemmed from its electric discharge processing technology. Recently they have also succeeded in three-dimensional processing. This paved the way for Matsushita Research Institute to become the world-first supplier of a full series of miniscule machine tools.

So-called micromachines, such as microsensors, microactuators and micro-robots, measuring from tens to hundreds of microns in size, have recently moved into the spotlight as the standard-bearers of today's most advanced technology. With a series of technological developments, micrographic processing in any shape has become possible, leading even closer to the realization of micromachines. Development of applied technology for micromachines is now actively under way. Applications range from medical sensors for implanting in the human body, micro-robots which give medical treatment and engines for artificial organs, to ultramicroactuators and motors which are capable of mounting optical

circuit elements of LSIs and making accurate measurements. In order to manufacture the miniscule parts used in these devices it is essential to perfect the technology for three-dimensional, precision processing in the order of from tens to hundreds of microns. Matsushita Research Institute already has the technology necessary to conduct micrographic perforation and boring of materials with diameters as small as five microns.

Matsushita Research has sold more than fifty micrographic processing machines, including exports. The technology involved in these machines is still two-dimensional but to construct micromachines, three-dimensional processing is necessary. With this objective, Matsushita Research has developed three-dimensional processing by expanding its electric discharge processing technology, a technique so far used in two-dimensional processing.

This technology differs from conventional processing used for cutting tools, in that an electric discharge is used between the electrodes of the equipment and the materials being processed. Because there is no contact during the process, micrographic processing is possible.

Another difference between the new technology and generally used discharge processing equipment, is that processing in the sub-micron order is possible by controlling the discharge energy accurately and at minimal levels.

Far Better Nonlinear Optical Material for Devices Made.

Toray Industries, Inc., has succeeded in synthesizing a prominent organic benzylidene aniline-

based secondary nonlinear optical material for optical devices. The material is said to have the highest nonlinear optical constant among organic materials of this type; the company began research on the material for application to light-modulation and other optical devices.

The material is a 4'-nitrobenzylidene-4-natoxy-3-acetoaminoniline (MNBA) crystal having a wave length-conversion efficiency of as much as about 500 times that of lithium niobate the only secondary non-linear optical material now going into tests for commercial application. The development of the new material was reported early in April at a meeting of applied-physics researchers at Chiba University.

Nonlinear optical materials are among basic substances for devices for an optical computer that would ensure faster data processing. A development race for such materials for their commercial application has thus been underway in Japan and abroad.

Toray has been successful in singling out the material in question from more than 300 conjugate benzylidene aniline derivatives the company has synthesized.

Sealing Film for Solar Cells Developed

Bridgestone Corp. has successfully developed EVA resin-applied EVASAFF sealing film for solar cells, following its commercialization of transparent "WG-1620" and whitecolored "TW-1630" films for the same purpose. The company claims that all these products have excellent durability and sealing properties and help harness the energy of solar beams. It plans to step up "Clean-energy" business involving them, taking into account

that there is growing interest throughout the world in the environment and energy problems.

The WG-1620 film does not turn yellowish even when used for a long period of time and, as a result, maintains its high premeation rate for the sun's rays. In addition, it has no blocking properties and is endowed with high degrees of workability, durability, and adhesion to glass as well as superb sealing properties.

The company envisages promoting use of the three products in accordance with user needs.

Enthusiasm to develop energy alternatives to oil has toned down over the past two or three years due to oversupply and price reduction of crude oil. Recently, however, development of energy alternatives has been in the spotlight again since the need to protect the ozone layer and the "green-house effect" on the earth have triggered a lot of interest throughout the world.

Antibacterial Agents for Plastic As Masterbatch

BIO-GIKEM Inc., a Japanese biotechnology venture business based in Tokyo, has developed 11 antibacterial and antimold agents to be blended into various resins. It has been difficult to apply such agents synthetic resins in view of the mixing techniques involved and pool effects resulting from their application.

The company has established technology for through-production of many antibacterial and antimold agents from starting materials to masterbatch so that agents contained in plastics can maintain their effects for a long time.

The company hopes that the agents which are available as masterbatch will find markets for use in the food containers, plastic products for the kitchen and toilet goods. The sale target for the initial year is set at Y1.2 billion.

Ultrathin Film of Aromatic Condensation Polymer Produced

Professor N. Ogata of College of Science and Engineering of Sophia University and his Colleagues have succeeded in producing ultrathin film of polybenzothiazole (PBT) — an aromatic condensation polymer.

They extended a solution of di-benzyterephthalaldimine in chloroform over the surface of 2,5-diamino-1,4 benzenedithio dihydrochloride: Ultrathin (35A) PBT film was thereby formed upon the solution surface, they piled up several layers of the film on a hydrophobic substrate using a horizontal adhesion process and, as a final step, subjected the resultant laminated film to thermal treatment (300°C) for 30 minutes.

Thirteen hours of heating the product in air at a temperature of 300°C proved that it has strong thermal resistance.

Aromatic condensation polymer is regarded as promising electronics material since it is endowed with a high degree of thermal resistance and electric insulation. To date, however, it has been difficult to produce thin film therefrom.

The research group previously synthesized ultrathin polybenzimidazole/polybenzoxazol films by combining the aforementioned processes.

JHDE WINS CONTRACTS

Uhde has won two new contracts for projects in South Korea. Plastics manufacturer Namha Chemical Corp has placed an order for a nitric acid plant using Uhde's high pressure process. The new plant, scheduled to go on stream in October 1990, will have a capacity of 300 ton/day. Uhde will supply basic engineering and the plant's major equipment, and will share detail engineering and construction work with a local Korean engineering firm.

The high pressure process is particularly economical for smaller nitric acid plants, according to Uhde. The new plant will conform to strict international emissions regulations, the contractor said.

Uhde has also received a contract from Korea's Pai Kwang Corp to revamp a chlorine plant it built for the company several years ago. Capacities of the 36 ton/day plant will be expanded to an unspecified output and the process converted to Uhde's Hub membrane cell.

ECOGEN CORN JV

In the US, Ecogen and Pioneer Hi-Bred International are to collaborate in the development of hybrid corn resistant to the European corn borer, an insect which causes significant crop losses.

Ecogen, which specializes in biological pest control, will develop and clone bacterium genes which produce proteins fatal to the corn borer. The company has already isolated several of the genes. Using genetic engineering techniques, Pioneer Hi-Bred will implant the genes in the corn plants. If the project is successful, the corn strains will be resistant to the pest.

News About New Projects

ICI TO EXPAND MDI PRODUCTION

Nippon Polyurethane Industry is expanding its production for the polyurethane intermediate diisocyanate (MDI), in Japan. This project may be the first of many in the Far East as other firms study plans.

Nippon Polyurethane, a joint venture between Hodogaya Chemical, Tosoh Corp and ICI, will invest Yen 9bn (\$69.3m) in a 70,000 ton/year MDI unit at its factory in Shin-Nanyo city. The plant, scheduled for completion by the end of 1990, has been designed so that the capacity can be further raised to 70,000 ton/year with minor modification.

Upon completion of the plant the company's total capacity will be 100,000 ton/year. As demand for MDI is growing quickly, Nippon Polyurethane expects that the capacity will be increased to 130,000 ton/year. The company will increase its own supply of the aniline feedstock and Tosoh will supply chlorine, caustic soda and utilities.

Other companies are believed to be eyeing the Far Eastern MDI market. Bayer BASF, Dow and Mitsui Toatsu are all studying plans for facilities in the Republic of Korea. The Korean market for MDI currently stands at 25,000-30,000 ton/year and is expected to rise to 50,000 ton/year within a few years.

BASF Japan is planning to build a 40,000 ton/year facility in collaboration with Hanyang Chemical Industries. Mitsui Toatsu Chemicals is to build a 40,000 ton/year facility in combination with

Kumho Petrochemical Industries. Bayer will partner Mitsubishi Kasei in a plant to distil and refine raw MDI. Dow Chemical admits that it is studying the possibility but this is at such an early stage of setting up a Korean MDI unit it cannot confirm whether the project will proceed.

PUSRI STUDIES THREE UNIT AMMONIA REVAMP

Indonesia's Pupuk Sriwidjaja (Pusri) is studying the revamp of its three ammonia units at Palembang, Sumatra, in collaboration with ICI. The three units, which have a combined nameplate capacity of 607,000 ton/year, will be upgraded to increase output by 20 per cent and cut back energy consumption by 10 per cent. The total cost of the project is put between \$30-40m.

ICI's main involvement will be in the front end of the project. During the next year, the company will evaluate the various process designs and engineering increasing capacity and improving energy efficiency. Engineers from Pusri will spend a year at ICI's offices in Billingham, UK, before returning to Indonesia to carryout detailed engineering design and construction themselves, with ICI providing support.

If plans go to schedule, the three units should be updated towards the end of 1991. The revamp work and new construction will be timetabled to coincide with planned maintenance shutdowns.

While ICI says a proper evaluation will take place during the year, it has already identified specific areas that will boost output and improve efficiency. These

include increasing the air supply to the unit, improving the overall steam power cycle efficiency and retrofitting the ammonia converter.

The three units at Palembang, Pusri I, II and III, were built between 1963 and 1976 by Kellogg and Toyo Engineering. They are all based on Kellogg technology.

ATOCHEM LICENSES FIT TO ENICHEM

Atochem has granted Enichem a licence to operate its FIT (Fibre Impregnated thermoplastics) process. The technology is used to make strong, high performance composites based on thermoplastic resins. Products made by the process can be used as structural components in aerospace and automotive industries.

With this licensing agreement, Enichem will upgrade its existing range of engineering polymers and develop new materials. The Italian company is targeting product development for the electronics, truck and aircraft sectors.

The Enichem deal is Atochem's second licensing agreement for FIT. The first was granted to Ciba-Geigy in the US for the production of plastics for the aerospace sector.

In the FIT process, the polymer fibre is impregnated with very finely powdered thermoplastic resins and then encased by extrusion with a compatible polymer. When heated, the sheathing and impregnated polymer fuse. The resulting products can be woven, braided or preformed. According to Atochem, FIT simplifies the manufacture of thermoplastic resins and allows production to be automated.

ETHYL GOES AHEAD WITH BELGIAN ALPHA OLEFINS UNIT

Ethyl Corp. the world's largest merchant marketer of alpha olefins, is going ahead with plans to build its first European plant to produce the chemicals.

The US company has begun to screen contractors for the proposed plant and will develop a package for potential bids from European engineering companies. Firms on the list are believed to include Matthew Hall, Tractobel, Foster Wheeler, Coppee-Courtoy, Badger, M W Kellogg and Davy McKee.

"I have little doubt that the project will go ahead," Art Frens, director of industrial chemicals at the Brussels-based Ethyl SA, told ECN. Approval for the 200,000 ton/year facility is expected early this spring, he added.

To be based at the company's chemical complex in Feluy, Belgium, the plant is scheduled on line in the second half of 1991. Part of the output will be used in the 36,000 ton/year polyalpha olefins plant Ethyl is building at Feluy and the remaining 160,000 ton/year-plus will be sold primarily on the European market.

By far the largest consumer of the alpha olefins, and the primary reason for building the plant in Europe, is the polyolefins market, where the products are used comonomers in the production of linear low and high density polyethylene. Other outlets include lubricants and detergents.

The plant will be a major new user of ethylene in Europe requiring about 220,000 ton/year of the monomer. The Feluy complex will be connected to the ARG ethylene pipeline network and, according to Frens, the new plant will source feedstock from se-

veral suppliers, either on or with access to the ARG.

Ethyl sells significant quantities of alpha olefins on the European market from its Houston, Texas-based plant, which has a capacity in excess of 450,000 ton/year.

This will make Ethyl Europe's second largest producer of alpha olefins. Shell, Europe's leading producer, is expanding capacity at its Stanlow, UK, plant from 220,000 to 270,000 ton/year, using the Shell Higher Olefins Process (Shop). This could be further expanded to 400,000 ton/year.

DU PONT BULGARIAN CONTRACT

Du Pont Canada will supply its process technology for a new linear low density polyethylene facility in Bulgaria. The contract, valued around \$50m, has been concluded between Chiminvest and Lummus Crest in the Netherlands.

Under the terms of the deal, which includes buy back provisions, Lummus will supply a 50,000 ton/year linear low-to-high density polyethylene plant for the Burgas petrochemical complex by early 1992.

Combustion Engineering Marketing, a member of the CE Lummus Crest Group, will be responsible for selling the product on the Western markets. It is expected that some 25,000 ton/year will be marketed by Combustion in Europe.

The plant will be designed to use octene-1 and butene-1 comonomers. The former, used to produce higher grade polyethylene, will be purchased on the open market. Butene-1 will be recover-

ed from a refinery stream, using some additional equipment.

The plant will use feedstock from a new 150,000 ton/year ethylene cracker now under construction at Burgas. Based on the M W Kellogg millisecond technology, that plant is being supplied by a consortium comprising Mitsubishi, Kawasaki and Kellogg.

Meanwhile Snia BPD of Italy has been awarded a contract to supply a 14,000 ton/year acrylic fibres complex at the Burgas petrochemical plant. The plant will replace an ageing, Fabelta-process facility at the site.

ICI PARAXYLENE INVESTMENT

ICI is to spend about £1.5m (\$2.5m) on the expansion of its paraxylene plant at Wilton on Teesside, UK. The project will increase the company's paraxylene capacity. The scheme is part of ICI's ongoing investment programme aimed at upgrading both the quality and quantity of paraxylene at Wilton.

In March 1988 the company announced a £12m project to upgrade pure terephthalic acid (PTA) capacity and improve paraxylene quality. Paraxylene is the key raw material for PTA, the preferred feedstock for polyester.

An ICI spokesman said: "This latest expansion will result in a reduction of ICI's dependence on external suppliers for the key raw material for our PTA business. In a market which is currently tight, with escalating pricing, this will further strengthen ICI's overall competitive position."

ICI's own technology will be used on the project. Work will start immediately and completion is expected by the second quarter of 1990.

Environment

RECHEM FACES RENEWED PUBLIC ENQUIRY CALL

The UK's leading waste management concern Rechem is facing renewed calls for a public enquiry into its Pontypool incineration operations from the local borough council, which has found higher than expected levels of polychlorinated biphenyls (PCBs) in foliage samples taken near to the plant.

Samples taken by Torfaen council last summer following an incident at the plant showed PCB concentrations of 130-200ppb in grass close to the site's boundary. The council withheld the results until data from sampling carried out by the national pollution inspectorate in 1986 was published a few weeks ago. These tests revealed PCB concentrations of 9.4-19ppb. More recent tests at Torfaen indicate levels of 500-1,200ppb.

According to the council's environmental health officer David Thomas, analysts have said its sampling methodology is comparable to those used by the pollution inspectorate.

Following a meeting recently the council decided to carry out more sampling and consult toxicological experts with the results. It also agreed to refer the matter to the secretary of state for the environment and the prime minister, with a renewed demand for a public enquiry to be set up to look into the activities of the company.

Thomas points out that the council has never campaigned to have the incinerator shut, but only called for independent public enquiries. According to Thomas numerous calls for such an enquiry

have been turned down on the grounds of insufficient evidence.

However, Rechem says that its environmental monitoring programme over the last 12 months has proved its high temperature incineration operations at Pontypool do not threaten the environment. In a release issued by the firm the data collected from sampling points close to the plant is consistent with the normal levels in the wider area monitored by Rechem.

The company's figures published for last November and December average at 172ppb upwind and 178ppb downwind of the plant. Rechem argues that if there was any environmental impact from the incinerator on the local area downwind samples would be expected to exhibit significantly higher levels of PCBs than upwind samples. However, grass values for PCBs continue to show variations which are unexplained.

The waste incineration firm continues, saying: "The average annual emission level of $0.32 \mu\text{g}$ /cubic metres is almost a factor of three below the widely accepted standard of 99.9999 per cent destruction of PCBs and clearly indicates Rechem is not contributing to environmental levels of PCBs."

TEXACO RECONVERTS SLUDGE

Texaco has developed its coal gasification technology for converting waste materials into clean synthesis gas. Demonstrated at the company's Montebello research laboratory in California, the process used waste from an oil field. But the company claims the technology can equally be

used as an environmentally sound way of transforming chemical waste sludges into reuseable materials.

In the process, waste sludges are gasified with a coal slurry. Under high temperatures and pressures in the gasifier, the sludge and slurry mixture is converted to clean synthesis gas. According to Texaco no environmentally hazardous materials are produced in the reaction. The research work was funded by the Californian health services department.

TOXIC DUMP SYSTEM

A system has been developed by West Germany's Degas to aid the management of disused toxic waste dumps. Called Alexis, the computerized information system can be programmed to analyse data on the chemical make-up of waste and site geological properties.

According to the system's developers it will allow maintenance and cleanup procedures to be devised and a list of priorities to be drawn up.

DEAD SEA WORKS PLAN

Dead Sea Works, a subsidiary of Israel Chemicals, is to begin construction on a potassium sulphate production facility. The plant will use potash from the Dead Sea and gypsum recovered from the wastes of phosphoric acid production.

Dead Sea Works has committed \$3m to the project which will require an additional \$2m at a later stage. The second stage involves the scaling-up of capacity to 300,000 ton/year of potassium sulphate.

Biotechnology

ROCHE TEAMS UP WITH XENOVA

Hoffmann-La Roche is teaming up with Xenova, the UK biotechnology company, to develop novel immunosuppressant drugs. These products have potential use in organ transplant operations as they control host organ rejection by suppressing the body's immune defence system. Xenova will develop a novel biochemical assay to detect immunosuppressive compounds and will screen a large range of micro-organisms which can produce chemicals with immunosuppressant properties. The company will also isolate, purify and characterize active compounds detected during screening. For its part, Roche will evaluate and develop chemical leads emerging from Xenova's work.

JAPANESE U.S. BUY

Yamanouchi Pharmaceutical is to acquire US healthcare and household product marketing company Shaklee, under an agreed purchase worth some \$672m.

Shaklee, which posted profits of \$27.2m on sales of \$627.5m last year, sells various healthcare and household products direct to homes throughout the U.S. While, Yamanouchi's business is based largely on sales of prescription drugs, the Japanese firm is expanding into consumer products and last year bought a 78 per cent stake in Shaklee Japan for \$350m.

Yamanouchi's move has seen off a hostile \$280m bid for Shaklee made by an investor group led by corporate raider Irwin Jacobs.

MERIEUX PROPOSES JV WITH CONNAUGHT

France's Institut Merieux is proposing to set up a biomedical joint venture with Connaught BioSciences of Toronto, Canada. Last year Institut Merieux failed to increase its 12.6 per cent in Connaught, then called CDC Life Sciences, by 20 per cent.

According to reports, the Canadian firm finds the joint venture idea more palatable, although Connaught has asked for some of the proposal's details to be clarified.

Merieux, which is controlled by Rhone-Poulenc, wants to combine its human health division with Connaught's laboratories in a jointly owned Dutch company to be called Merieux-Connaught. This, the French firm believes, would result in a business that is large enough in research and marketing resources to compete with large pharmaceutical companies. According to Merieux the merged divisions would have sales of around Can\$544m/year (\$457m/year).

Meanwhile, a subsidiary of Institut Merieux, Laboratoire des Stallergenes, has set up a joint venture with Institut Pasteur covering in vivo diagnostics and treatments of allergies.

The new company, to be called Stallergenes, will own products in this area currently made by both partners and will be responsible for production and marketing.

Sweden's Pharmacia, which has been marketing Institut Pasteur allergy products since 1983, will cease to do so.

BASF INVESTS IN UK RESEARCH

In the UK BASF Chemicals is planning to invest £6m (\$10.4m) in a new technical centre at Seal Sands, Teesside. Initially, the facility will support and develop the company's current technology but will eventually be used for the development of new products and processes.

The building will include several laboratories and a pilot plant facility, allowing process conditions to be studied in detail and help technology improvements to be transferred into large scale plants at Teesside.

BASF makes acrylonitrile, adiponitrile and hexamethylene diamine at the site. These materials are used to manufacture nylon fibre and plastics.

Main areas to be covered include electrochemistry, catalysis, materials technology and advanced analytical techniques. Around 30 technical personnel, specializing in chemical engineering, corrosion science and occupational hygiene, will be located in the new laboratory.

Planning permission for the centre is to be submitted soon and BASF Chemicals hopes to start building in September with completion in 1990.

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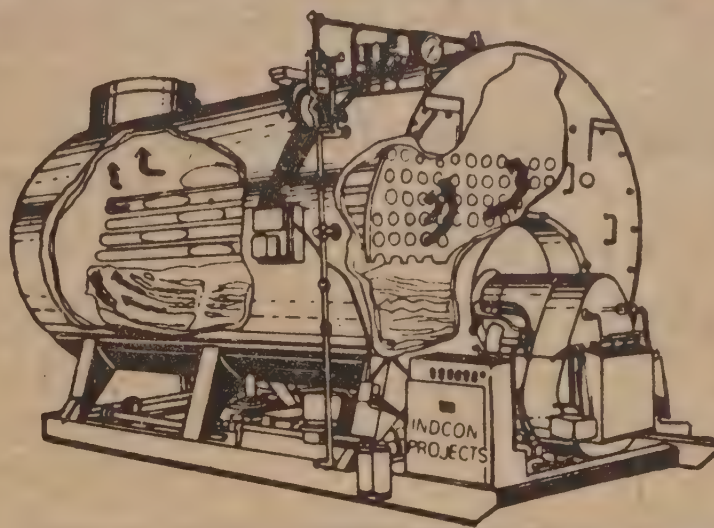
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MARKET INFORMATION

Titanium Dioxide Likely To Go Up

Owing to severe powercut, the production of titanium dioxide at the Travancore Titanium's plant, has come down sharply. This is likely to push up the price in the Bombay market. Prices of a number of items such as acrylamide, gohsenol GH

17 showed downward trends, whereas aniline oil moved up to Rs. 65. Caustic soda (solid) shot up to Rs. 13. The solvent section was steady. Dye intermediates were being quoted higher although dyestuff prices were steady.

We cannot guarantee the accuracy of the prices published in **CHEMICAL WEEKLY** as they are based only on the enquiries made by our correspondent —and, as such they are not **FIRM PRICES** as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

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Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	5.60
Ammonium chloride	3.00
Ammonium nitrate	6.50
Arsenic white powder	23.00
Acrylamide (Resale)	68+ST
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.20

Borax (Granular)	15.00	Cobalt oxide	280.00
Borax (Powder)	15.25	Cresylic acid	45.00
Boric acid (Tech)	23.00	Camphor (Indian)	105.00
Bisphenol-A	70.00	Cream of Tartar (Tech.)	70.00
Butyl carbitol	50.00	Citric acid (Belgium) (Resale)	48.00
Caustic soda (Flakes)	13.45	Citric acid (Indian) (Resale)	51.00
Caustic soda (Solid)	13.00	Copper sulphate	24.00
Caustic soda (Lye)	7.00	Chromic acid	61.00
Calcium chloride 70% (Solid)	3.25	Ethylene urea	58.00
Calcium chloride 75-80%(fused)	3.50	Ferric chloride (Lumps)	5.50
Calcium chloride 36% (Anhydrous)	5.00	Ferric chloride (Anhydrous)	16.00
Calcium carbonate (precipitated)	4.25	Glue flakes	15.00
Calcium carbonate (Activated)	4.75	Glue sheets	6.75
		Gohsenol GH-17	112+ST
		Hydro	40+ST

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Industrial Wax	25.00	Sodium nitrite (Resale) per 50 kg.	680.00	Benzyl Chloride	34.00
Litharge	40.00	Sodium chlorite 80% (Spain)	88.00	Benzo trichloride	16.00
Lead Acetate (Tech.)	31.25	Soda Ash (Tata)	5.00	Benzoyl chloride	22.00
Lithopone	18+ST	Soda Ash (Birla)	4.50	Bromine Liquid	90.00
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PARACETAMOL IP
SULPHAMETHOXAZOLE IP
VITAMIN B-2, 5 PHOSPHATE
- INJECTABLE
TINIDAZOLE

Delhi Office

Mr. SURINDER PASRICHA

M/s. MEDICINE CHAMBER

1726/C, Bhagirath Palace,
Chandni Chowk,
DELHI-110 006.

Phones: Off: 235839/234131

		Brill. Fast Helio 2R	385.85	Red 2B	422.40
ACID COLOURS	Per Kg.	Brill. Fast Helio 2RS	177.30	Red FB	425.80
		Brill. Fast Helio BS	116.10	Red Violet FBL	622.00
Acid Violet 4BS	*190.00	Brill. Violet Extra	181.45	Orange 3R	254.20
Acid Maroon V	110.00	Blue 2B	102.50	Violet 3R	370.50
Acid Orange II	112.55	Blue G	220.45	Violet RL	355.70
Acid Orange ILY	93.85	Sky Blue FB	242.00	Violet 6R	638.20
Acid Red A	137.00	Copper Blue GR	190.25	Scarlet RR	283.50
Acid Scarlet 3R	128.35	Fast Greenish blue GL	114.60	Rubine 3B	289.10
Acid Red 3BN	*195.00	Developed Black BT	149.95	Rubine CB	449.50
Acid Red R2R	132.00	Blue NB-2B	348.45	Blue GL	419.00
Acid Red RS	88.00	Blue NB-2BG	214.70	Blue BGF	805.80
Acid Patent Blue AS	*280.00	Developed Black NB-GHB	214.70	Navy Blue RE	359.90
Acid Green V	*375.00	Green B	142.75	Brown 3REL	272.80
Acid Coomasi Blue	200.00	Green NB-B	218.90	Black GEL	420.10
Acid Yellow 5GN	65.00	Green 2B-N	218.90	Dark Brown 3B	411.10
Acid Red PG	85.00	Brown MR	197.40		
Acid Red GRS	78.00	Brown CN	137.00		
Acid Black 10 BX	157.15	Golden Brown G	175.85	BASE COLOURS	Per Kg.
Acid Black BX	126.95	Gatechin G	155.70		
Acid Black Wax	135.50	Omega Tan	161.45	Fast Yellow GC	77.75
Crosein Scarlet MOO	200.30	Gatechin GS	102.80	Fast Orange GC	128.40
Procinil Yellow GS (ICI, UK)	265.00	Black E Hly. Conc.	180.15	Fast Scarlet R	198.05
Procinil Red GS (ICI, UK)	530.00	Black E Extra Hly. Conc.	180.15	Fast Scarlet RC	128.40
Procinil Blue RS (ICI, UK)	315.00	Black NB-ER Hly. Conc.	290.50	Fast Scarlet RCR	105.60
Frociniil Scarlet G (ICI, UK)	600.00			Fast Scarlet G	115.75
Procinil Orange G (ICI, UK)	250.00			Fast Scarlet GN	92.95
Procinil Rubine (ICI, UK)	550.00			Fast Scarlet GG	77.75
* To get resale price add 6% tax.		DISPERSOL COLOURS	Per Kg.	Fast Scarlet GGS	73.95
DIRECT COLOURS	Per Kg.			Fast Red B	233.50
Yellow 3GX	114.00	Red B 3B Conc	611.50	Fast Red RC	115.75
Gun Yellow RCH	175.85	Red B 2B Conc	797.90	Fast Red R Flakes	158.80
Fast Yellow GCH	171.50	Red CB Powder	1048.25	Fast Red TF	181.60
Yellow CFG Hly. Conc.	721.00	Red D2B Powder	589.85	Fast Red TR Oil	223.35
Fast Yellow GS	126.96	Violet C 4R Conc.	1202.70	Fast Red RL	251.20
Fast Yellow CHRS	116.85	Blue BG Conc	580.65	Fast Red KB Oil	251.20
Viscose Orange A	210.35	Blue BN Powder	128.20	Fast Bordeaux GP	236.00
Fast Orange GR	171.50	Blue D 2R Powder	588.25	Fast Garnet GBC	103.05
Red	122.65	Navy BT Conc	531.95	Fast Violet B	548.80
Dark Tan	98.15	Blue B 2G Conc	577.95	Fast Blue BB	566.50
Red IIR	98.15	Black BT Conc	319.50		
Red 4B	217.55	Blue BR	482.40		
Bordeaux BW	170.10	Yellow 7GL	813.20		
Fast Scarlet 4BS	223.50	Yellow 5RX	269.90	NAPHTHOL COLOURS	Per Kg.
Red 12B	220.45	Yellow 3G	473.20		
Bordeaux Hly. Conc.	249.20	Yellow	140.00	ASG	301.85
Cotton Red N	117.05	Yellow AL	167.20	AS	205.65
Brill. Fast Helio B	362.85	Yellow Brown REL	311.70	ASSW	379.10
		Yellow FFL	571.40	ASBS	253.75
		Gold Yellow GG	320.80	ASBO	266.40
		Pink REL	593.00	ASD	209.45
		Red BEL	615.60	ASOL	243.60

STR	369.00	Blue H-FRD	305.80	Brill. Purple 2R Hly Conc.	744.25
SPH	336.05	Navy Blue H3R	333.75	Brill. Purple 4R Supra Disp.	604.25
SE	236.00	Blue H 5RX	286.20	Brill. Purple 2R Acra Conc.	779.85
SEL	249.95	Navy Blue M3R	355.70	Blue 2R Powder Fine	675.30
SLB	2002.35	Brill. Blue MR	405.60	Blue BC Acra Con Pdr. Fine	1013.15
SBT	2459.45	Brill. Blue M RX	214.20	Blue BC Conc. Pdr. Fine	713.65
SWG	143.00	Brill. Blue M-G	226.45	Blue R Conc. Pdr. Fine	719.70
SSG	538.65	Blue M 4GD	369.40	Blue Conc. Powder	645.80
SSR	652.60	Navy Blue M RB	341.85	Brill. Blue 2R Hly. Conc.	378.55
		Turquoise M-G	240.30	Blue RR Supra Powder	629.35
		Brill. Blue M GX	516.25	Brill. Blue 2R Supra Disp.	115.65
PROCION COLOURS		Blue 3R Acra Powder	718.20	Dark Blue 2R Powder Fine	512.65
	Per Kg.	Dark Brown H 6R	248.45	Blue BC Supra Disp.	419.65
Golden Yellow HR	207.95	Cobalt Oxide	285.00	Jade Green XBN Powder Fine	555.80
Brill. Yellow H4G	145.65	Green H4BD	287.00	Jade Green XBN Acra	
Supra Yellow H-8GP	168.55	Green H-E4BI	169.80	Conc. Pdr	1026.05
Brill. Yellow HE6G	214.75	Red Brown H IF	143.25	Jade Green 2G Pdr. Fine	533.25
Yellow G-E4R	276.05	Orange Brown H 28	209.05	Jade Green 2G Ptg. Paste	125.40
Brill. Yellow H7G	332.30	Brown M GRN	188.80	Jade Green XBN Ptg. Paste	126.00
Yellow M4R	275.45	Black H-N	314.20	Jade Green 2G Supra Disp.	618.00
Yellow MGR	387.65			Olive D Pdr. Fine	563.90
Brill. Yellow M4G	201.15			Olive Green B Supra Disp.	421.70
Brill. Yellow M8G	366.10	SULPHUR COLOURS	Per Kg.	Jade Green XBN Supra Disp. (N)	327.30
Yellow M3R	244.70	Navy Blue	210.35	Olive OMW Powder Fine	698.55
Brill. Orange H2R	303.80	Green G	194.55	Olive OMW Supra Disp.	538.05
Brill. Red H7B	157.95	Black Grains Extra	72.25	Olive D Supra Disp.	361.70
Brill. Orange M2R	313.15	Black Grains OG	73.70	Olive R Supra Disp.	470.25
Brill. Red H8B	213.55	Black GXE Conc.	70.85	Olive D. Ptg. Paste	193.00
Brill. Scarlet H RN	245.05	Black GXE	57.90	Olive Green B Ptg. Paste	199.10
Supra Red H-3BP	179.80	Black GXR	69.40	Olive Green B Acra Conc.	741.10
Brill. Red H-F3B	243.45	Black Grains 800	62.80	Olive R Acra Conc.	779.85
Brill. Magenta HB	182.00	Black EXR Grains	73.70	Brown R Pdr. Fine	869.45
Brill. Red M 5B	160.05	Black EXR Grains 800	59.35	Dark Brown 3R Fine	826.25
Brill. Red M 8B	218.35			Brown G Supra Disp.	582.05
Brill. Pink MB	137.10			Brown 2G Supra Disp.	716.10
Brill. Magenta MB	163.65	VAT COLOURS (ICI)	Per Kg.	Brown R Supra Disp.	547.35
Brill. Purple H-3R	219.55	Yellow 5G Supra Disperse	561.85	Brown BR Powder	867.75
Brill. Purple H-7R	175.40	Yellow 5G Acra Conc	818.60	Dark Brown 3R Ptg. Paste	217.15
Navy Blue H 3R	333.75	Gold Orange 3G Pdr. Fine	1158.45	Dark Brown 3R Supra Disp.	529.60
Brill. Blue H-GR	406.40	Brill. Orange 6R Pdr. Fine	624.35	Brown G Acra Conc.	967.95
Brill. Blue H5G	207.95	Gold Orange 3G Supra Disp	693.85	Brown M. Powder Fine	768.80
Blue H 5RX	286.20	Brill. Orange 6RX Powder	394.30	Grey M. Supra Disp.	585.45
Blue H 7G	213.95	Brill. Red 3B Pdr. Fine	1214.15	Blue BC Acra Conc. Pdr. Fine	762.70
Blue H 7RX	358.15	Brill. Red 3B Supra Disp	867.45	Direct Black AC Supra Disp.	415.75
Turquoise HA	265.05	Brill. Purple 3R Acra Powder	827.05	Direct Black AC Pdr. Fine	574.70
Supra Blue H-3RP	595.30			Direct Black CH Supra Disp.	490.45
Supra Turquoise H 2G P	181.50			Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: MAY 12, (NNS) Prices of potassium permanganate went up sharply by Rs. 1,550 per 50 kg in the Delhi Chemicals market during the week under review due to negligible supply by manufacturers, says NNS. Titanium dioxide spurted by Rs. 4/8 on heavy speculation. Acute shortage of goods pushed up the prices of ammonia bicarb, mercury, tartaric acid, borax and boric acid, whereas Rangolite Germany dropped by Rs. 3 per kg owing to better inflow. Business was good.

Potassium permanganate registered a sharp rise of Rs. 1,550 and touched a new peak of Rs. 4,900 per 50 kg due to non-availability of stocks as well as higher purchases made by consumers. On account of increased speculation among stockists as well as dwindling supply by manufacturers, titanium dioxide anatase rose sharply by Rs. 8 at Rs. 106 per kg. One month ago the prices of this commodity was quoted at Rs. 75 per kg. Similarly titanium dioxide RC-822 advanced by Rs. 4 at Rs. 103 per kg due to sustained demand shown by paint and plastic units.

Due to hike in prices by manufacturer phosphoric acid jumped up by Rs. 90 at Rs. 1,050 per 50 kg. Zinc oxide recorded a handsome gain of Rs. 2,000/7,000 at Rs. 42,000/52,000 per tonne due to acute shortage of stock. Carbon tetrachloride

hardened from Rs. 21.75 to Rs. 24 per kg due to increase in its prices by manufacturers.

Mercury advanced sharply by Rs. 200 at Rs. 12,500 per flask in the wake of dwindling stock position in local markets along with higher advices from Bombay. In Bombay prices of mercury hardened from Rs. 12,200 to Rs. 12,600 per flask. Tartaric acid recorded a rise of Rs. 200 at Rs. 7,450 due to fall in import from France and keen demand shown by stockists and consumers.

Borax granular and crystal hardened from Rs. 670 and Rs. 675 to Rs. 710 and Rs. 720 per 50 kg respectively due to higher demand shown by stockists in anticipation of a hike in its prices by manufacturers. Dwindling supply pushed up the prices of boric acid technical by Rs. 55 at Rs. 1,230. Ammonia bicarb hardened by Rs. 10 at Rs. 145 per 25 kg in the wake of good demand from Bengal and cut in supply by manufacturers. Chatkolite flared up by Rs. 6 at Rs. 66 per kg due to fall in import from China and poor stock position. Sodium hydrosulphite Tamil Nadu moved up by 75 paise at Rs. 37.75 per kg in the absence of selling. Citric acid slipped by Rs. 50 at Rs. 2,250/2,550 thanks to good supply. Rangolite Germany drifted lower by Rs. 3 at Rs. 71 per kg on better offerings.

(DELHI MARKET RATES AS ON MAY 12, 1989)

Ammonia Bicarb (Per 25 Kg.)	145.00
Mercury (Per flask)	12,500.00
Soda ash (Per bag)	340/350.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	565/570.00
Citric acid (Per 50 Kg.)	2,250/2,450.00
Stable Bleaching Powder	
Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCl	
(Per 25 Kg.)	95.00
Stable Bleaching Powder	
Maruti (Per 25 Kg.)	90.00

Stable Bleaching Powder	
Modi (Per 25 Kg.)	98.00
Sodium Bicarbonate (50 Kg.)	285/300.00
Sodium Hydrosulphite (Per Kg.)	35.00/40.00
Rangolite (Per Kg.)	66.00/71.00
Boric acid Technical (Per 50 Kg.)	1,230.00
Paraffin Wax (Per 50 Kg.)	750.00
Tartaric Acid (Per 50 Kg.)	7,450.00
Borax Granular (Per 50 Kg.)	710.00
Borax Crystal (Per 50 Kg.)	720.00
Sodium Nitrite (Per 50 Kg.)	660/760.00
Sodium Nitrate (Per 50 Kg.)	415.00

Camphor Thal (Per Kg.)	104.00
Camphor Powder (Per Kg.)	94.00
Menthol Bold (Per Kg.)	260.00
Menthol Medium (Per Kg.)	240.00
Menthol Flake (Per Kg.)	280.00
Glycerine (Per Kg.)	52/55.00
Sodium Silicate (Per quintal)	250/300.00
Hexamine (Per Kg.)	36.00
Acetic Acid Glacial (Per Kg.)	16.25
Copper Sulphate	
(Per quintal)	2,250/2,600
Formic Acid (Per Kg.)	26.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	27.50/27.75
Calcium Carbonate	
(Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	24.00
Acid Slurry Hard (Per Kg.)	32.00
Phosphoric Acid (Per 50 Kg.)	1,050.00
Potassium Nitrate	
(Per quintal)	900/1,200.00
Potassium Permanganate	
(Per 50 Kg.)	4,900.00
Sodium Bichromate	
(Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	475/500.00
Titanium Dioxide Anatase (Per Kg.)	106.00
Titanium Dioxide RC-822 (Per Kg.)	103.00
Zinc Oxide	
(Per metric tonne)	42,000/52,000.00
Phenol Carboic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.00
Chloroform (Per Kg.)	28.00
Sodium Sulphate	
(Per metric tonne)	3,200/3,500.00
Naphthalene Balls (Per 50 Kg.)	1,450.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	162.00
Naphthol ASG	252.00
Naphthol ASBS	250.00
Naphthol ASTR	325.00
Naphthol ASOL	208.00
Naphthol ASBO	225.00

DIRECT DYES	(Per Kg.)
Black E. Conc.	110/160.00
Diazo Black B.T.	105/135.00
Green B	100/127.00
Blue 2-B	60/92.00
Sky Blue FB	213.00
Basic Auramine	55/110.00
Basic Rhodamine	250/400.00
Basic Methylene Blue	92/130.00
Basic Violet	135/170.00
Basic Malachite Green	115/165.00
Acid Orange	45/80.00

Madras Market

The Market remained calm but for activity in the prices of chemicals which are produced by power intensive processes. Caustic Soda Flakes went up to Rs. 14,000 per MT during the mid-week but settled down to Rs. 13,000 per MT by the end. Sulphuric Acid prices also shot up and the prices were ruling around

Rs. 2,700 per MT. Alum - iron free prices also shot up to Rs. 4,000 on account of high prices of inputs. Production of Titanium Dioxide, Anatase continued to be affected due to labour unrest at TTP, Trivandrum. Calcium Carbide production was also affected very badly due to acute power shortage in the south.

Magnesium Chloride (per kg)	3.00
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	250.00
Oxalic Acid (per kg)	24.00
Paraffin Wax (per kg)	14.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	21.00
Polyvinyl Alcohol powder (per kg)	130.00
Pentaerythritol (per kg)	50.00
Phthalic Anhydride (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	360.00
Soda Ash (TATA) (per 75 kgs)	360.00
Sodium Bicarbonate (TATA) (per 50 kgs)	375.00
Sodium Silicate (per MT)	3,000.00
Sodium Bichromate (per kg)	26.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	13.00
Sodium Bisulphite (per kg)	4.25
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	72.00
Titanium Dioxide (Rutile) (per kg)	96.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	50.00
Zinc Chloride Powder (per kg)	12.50
Zinc Sulphate (per kg)	6.50

SOLVENTS

Acetone -- HOCL (per kg)	18.75
Butanol (per kg)	35.00
Butyl Acetate (per kg)	42.00
Benzene (per lit)	13.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	20.00
Chloroform (per kg)	26.00
Diacetone Alcohol (per kg)	29.50
Diethylene Glycol (per kg)	43.00
Dichloroethane (per kg)	17.00
Di-octyl Phthalate (per kg)	48.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	20.00
Isopropyl Alcohol (per kg)	28.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	25.00
Methyl Ethyl Ketone (per kg)	45.00
Methyl Isobutyl Ketone (per kg)	38.50
Phenol (per kg)	34.00
Sorbitol (per kg)	16.00
Triethanolamine (per kg)	60.00
Trichloroethylene (per kg)	25.00
1-1-1 Trichloroethane (per kg)	27.00
Turpentine (per lit)	16.50
Toluene (per lit)	16.00
Xylene (per lit)	17.00

(MADRAS MARKET RATES AS ON MAY 13, 1989)

Acetic Acid Glacial (per kg)	17.50	Calcium Carbonate (Precipitated) (per MT)	4,750.00
Aluminium Sulphate Iron free (per MT)	4,000.00	Citric Acid (per kg)	48.00
Ammonium Bicarbonate (per 25 kgs)	125.00	Copper Sulphate (per kg)	24.00
Ammonium Chloride (per MT)	3,000.00	Cresylic Acid 98-99% (per kg)	108.00+ED
Acid Slurry (per kg)	29.00	Pure Para Cresol 96% (per kg)	77.00+ED
Barium Carbonate (per kg)	6.00	Meta Para Cresol 42% (per kg)	46.00+ED
Barium Chloride (per kg)	5.50	Formic Acid (per kg)	27.00
Boric Acid Technical (per kg)	24.00	Formaldehyde (per kg)	7.50
Bleaching Powder (per 50 kgs)	220.00	Glue Flakes (per kg)	15.00
Borax (per 50 kgs)	650.00	Glycerine (per kg)	48.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	13,000.00	Hydrosulphite of Soda (TCPL) (per kg)	40.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	13,000.00	Hydrosulphite of Soda (IDI) (per kg)	42.00
Calcium Chloride 70% Solid (per MT)	3,000.00	Hydrosulphite of Soda (BASF) (per kg)	42.00
Calcium Chloride Anhydrous (per MT)	5,750.00	Hexamine (per kg)	29.50
Calcium Carbonate (Activated) (per MT)	5,750.00	Hyflo Supercell (per kg)	19.50
		Hydrogen Peroxide (per kg)	29.00
		Litharge (per kg)	40.00
		Lead Acetate (per kg)	42.00
		Magnesium Carbonate (per kg)	19.50

International Bulk Chemical Prices

Spot prices are as on April 26, 1989

Naphtha prices rose to \$183-185 (cif) following continuous rise in crude prices. Ethylene supply eased & prices were quoted around \$875-900 (cif). Strong demand for C₄ materials pushed up prices of butadiene to \$285-295/ton fob.

Benzene prices remained stable at \$455-460/ton NWE following lack of sustained demand. Toluene prices went up to \$385-395/ton on account of anticipated increase of octane demand. Lack of activity pushed prices of paraxylene down

to \$685-705/ton NEW. Orthoxylene and xylene remained stable. Styrene prices fell further. T1 was quoted at \$820-840 cif and T2 at \$885-895 (fob). Methanol prices also slid to \$140-144/ton cif and chances of recovery seemed remote.

Product	European spot price range \$/ton	US price range \$/ton
Ethylene	875-900 (cif)	727-747
Propylene (100% basis)	611-621 (cif)	462-528
Butadiene	285-295 (fob)	396-418 (spot)
Benzene	455-460 (fob)	453-456 (spot)
Toluene	385-395 (fob)	361-364 (spot)
Xylenes (virgin)	460-465 (fob)	465-471 (spot)
(solvent)	455-460 (fob)	n.a.
Styrene	885-895 (T2) (fob)	881-892 (spot)
	820-840 (T1) (cif)	
Paraxylene	685-705 (fob)	n.a.
Orthoxylene	430-450 (fob)	n.a.
Phenol	n.a.	n.a.
Ammonia	168-170 (c&f)	142-150 (fob)
Methanol	162-165 (T2) (fob)	163-166 (fob)
	141-144 (T1) (cif)	
Naphtha	183-185 (cif)	n.a.

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
22/5	Uni Pioneer (V-007)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; Leghorn; Genoa; Marseilles (Fos); Valencia; Barcelona; Limassol; Las Palmas; Casablanca; Istanbul (Carting at G/H Cotton Depot)	28/5
20/5	Navigare	Seaspeed	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian Ports. (Carting at Hay Bunder No. 3)	24/5
		L. Triest	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples (Carting M-171/173 C.D.)	
20/5	Birgit Naber (Ger)	Samrat/ Hindustan/ Merzarlo	Felixstowe; Hamburg; Rotterdam; also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & all Destinations in U.K.; Benelux Germany; Italy; France; Switzerland & Austria. (Carting at M.O.D. No. 2 for Merzarlo) (Carting at M.O.D. No. 1 for Samrat & Hindustan)	26/5
21/5	A.S. Okan (Tur)	U.L.A.	Istanbul & Turkish Ports.	25/5
21/5	Bhartendu (NhavaSheva)	S.C.I.	U.S.S.R. Ports (Istanbul). (Carting at Kalamboli CWC)	25/5
22/5	B. Lachowicz	Khemka	Gdansk. (Carting at Wadi Bunder No. 3)	26/5

(1)	(2)	(3)	(4)	(5)
4/5	Medipas Star (Ger)	L. Triest/ Samrat/ Hindustan/ Merzario	Jeddah; Barcelona; Marseilles; Genoa; Leghorn; La Spezia; Naples; with T.P. Trieste; Venice; Ravenna; Bari; Koper; Rijeka; Las Palmas; Santacruz; De Teneriffe; Malta; Limmassol; Alexandria; Casablanca; Tunis; Algiers; Lattakia; Tripoli; Benghazi; Oran; Point E Pitre; Port De France. (Carting M-171/173 Cotton Depot) Barcelona; Marseilles; La Spezia; Livorno; (Leghorn); Genoa; Naples and other Italian Ports and FCL only Beirut; Alexandria; Vallett; Lattakia; Mersin. (Carting at M.O.D. No. 1 for both) Genoa; Leghorn; La Spezia; Naples; Salerno; Marseilles; Barcelona. (Carting at M.O.D. No. 2)	28/5
4/6	Yulius Fuchik (Rus) (Voy-99 W/B)	Transocean	Odessa; Izmail; Reni (U.S.S.R.); Russe; Bulgaria; Budapest; (Hungary); Linz; Vienna (Austria); Bratislava; (Czechoslovakia); Deggendorff; Regenborg; (West Germany); (All ports on river Danube) (Carting at N/O-PD & G-PD)	5/6
1/6	Oyster Bay (V-4041)	Arbee/ Tata Tea	Mombasa & Dar Es Salaam (Direct); Seychelles; Nacala; Maputo; Kampala; J nja. Also inland destinations in East Africa. Mombasa; Dar Es Salaam (Direct) Beira; Mahe & inland destinations in East Africa.	5/6
24/5	Banglar Robi (V-3)	Sai Ship	Mogadiscio; Mombasa; Dar Es Salaam (Carting at W.B. No. 3)	30/5
24/5	Vishva Nandini (Ind)	S.C.I.	Seychelles; P. Louis; Tamatawe; Mombasa; Dar Es Salaam (Direct); Beira; Maputo. Via Mombasa & inland destinations in E. Africa	5/6
Stream	Tulsidas	S.C.I.	Colombo; Chittagong. (Carting at Kalamboli CWC)	26/5
19/5	Rostock	Marine Trans	Colombo	28/5
20/5	Eagle Moon	F.F.C. Co.	Colombo. (Carting at Timber Pond No. 1)	25/5
22/5	Mercs Serendib	Sai Ship	Colombo	25/5
24/5	Medipas Star	L. Triest	Colombo. (Carting at M-171/173 Cotton Depot)	28/5
Stream	Tulsidas (Nhava Sheva)	S.C.I.	Singapore & other Far East Ports. (Carting Kalamboli CWC)	26/5
18/5	Vega (Sing) (Voy-02)	O.S.A./ M.S.P.L.	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Kobe; Yokohama; Nagoya; Moji; Osaka; Busan; Tokyo; Simizu; Keelung; Tsingtao; Quindao; Xiangang; Shanghai. (Carting M-178/180 C.D. for O.S.A.) Singapore; Bangkok; P. Kelang; Penang; Jakarta; Manila; Hongkong; Keelung; Kaohsiung. (Carting at Hay Bunder No. 4)	25/5
20/5	Eagle Moon (V-009) (CYP)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta (T. Priok); Hongkong; Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Nagoya; Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsinking; Rangoon. (Carting at Timber Pond No. 1)	25/5
21/5	Piran (Yug)	Depe	Hongkong; Keelung; Kobe; Yokohama.	25/5
21/5	S/o. Tripura (Ind)	S.C.I.	Main Japan Ports.	30/5
22/5	Uni Pioneer (V-007) (Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimzu; Moji; Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot)	28/5
1/6	L.M. Noble Lady Silver Ship	M.C.S./	Singapore; Surabaya; Djarkata & other Far East Ports. Singapore; Far East & Japan Ports.	11/6
20/5	Eagle Moon	F.F.C. Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting T.P. No. 1)	25/5
Stream	Tulsidas (Nhava Sheva)	S.C.I.	Melbourne; Fremantle; Adelaide; Sydney. (Carting Kalamboli CWC)	26/5
23/5	Vega	O.S.A.	Sydney; Melbourne; Adelaide; Freemantle; Brisbane; Auckland; Wellington; Lyttelton; P. Chalmers. (Carting M-178/180 Cotton Depot)	25/5
20/5	Eagle Moon (V-009)	F.F.C. Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Bahrain; Kuwait. (Carting at Timber Pond No. 1)	25/5
4/5	Nowais n Halavi	Wasi & Son	Sharjah	30/5
1/6	Oyster Bay	Arebee	Lagos/Apapa; P. Harcourt; Abidjan; Tema; Takoradi; Monrovia; Lome; Freetown; Cotonou; Douala; Matadi.	5/6
20/5	Birgit Naber	Merzarlo	Dakar; Abidjan; Monrovia Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Blassa. (Carting M.O.D. No. 2)	26/5
4/5	Medipas Star	L. Triest	with T.P. Lagos/Apapa; Abidja; Dakar; Kouala; Cotonou; Nouakchott; Libreville; Tema; Matadi; Conakry; Freetown; (Carting M-171/173 C.D.)	28/5

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AMINOPHYLLINE BP/USP :
From China: Rallis India Ltd., 500
kgs., Rs. 66,684.

AMOXYCILLIN TRI HYDRATE
BP 80 : From Australia: Ranbaxy
Lab Ltd., 400 kgs., Rs. 4,60,-
310.

PARACETAMOL: From China:
Inga Labs Pvt. Ltd., 1,000 kgs.,
Rs. 80,021.

PENICILLIN G : From Switzer-
land: Gujarat Lyka Organics Ltd.,
10,800 Nos. Rs. 26,33,827.

PROPYLENE GLYCOL USP :
From USA : Uttamlal (Expor-
ters) Pvt. Ltd., 25,800 kgs. Rs.
4,79,757.

CYCLOHEXANONE: From FRG:
Murugappa Electronics Ltd., 7,-
030 kgs., Rs. 1,69,135.

D-ALLETHRIN: From Japan :
P.L. Chemicals Ltd., 160 kgs.,
Rs. 3,63,632.

D-PARAHYDROXY PHENYL
GLYCINE CHLORIDE HCL: From
Singapore: TTK Chemicals Ltd.,
1,000 kgs., Rs. 3,04,509.

DESMODUR T 65 : From FRG:
U-Foam Pvt. Ltd., 10,000 kgs.,
Rs. 3,45,617.

DEOXYURIDINE : From USA :
The Kasturba Medical College, 6
kgs., Rs. 18,103.

DIALLYL PHTHALATE : From
Netherlands : Hyderabad Con-
nectronics Ltd., 1,000 kgs., Rs.
1,52,254.

2-6 DIMETHYL ANILINE :
From Switzerland: Crew Chemi-
cals Ltd., 14,820 kgs., Rs. 6,15,-
999.

DIMETHYL SULPHOMIDE :
From Japan: Prasad Drugs Ltd.,
7,920 kgs., Rs. 1,94,625.

ETHYL ACRYLATE : From
FRG: Aksol Chemicals, 14,060
kgs., Rs. 3,63,918.

ETHYL CYANOACRYLATE :
From FRG: Darien Electric, 57.75
kgs., Rs. 43,057.

ETHYL FORMATE: From FRG:
Tamilnadu Dadha Pharmaceuti-
cals Ltd., 2,160 kgs., Rs. 96,511.

FURAZOLIDONE : From FRG :
Mohan Pharma, 100 kgs., Rs.
12,333.

GLYCERINE : From FRG: Kho-
day R.C.A. Inds., 10,000 kgs.,
Rs. 2,57,776.

GUM BENZOIN : From Singa-
pore : Rasiklal Barai & Co., 3,-
526 kgs., Rs. 75,996.

GUM ROSIN N GRADE : From
China: Tirupathi Industries, 18,-
000 kgs., Rs. 1,36,021.

HYDROGEN CHLORIDE : From
UK: IEL Ltd., 2,064 kgs., Rs. 82,-
816.

MATERIALS IMPORTED

MADRAS (From 1-3-1989 to 9-3-1989)

ACETONE: From USA: Pradeep
Drug Co., 12,705 kgs., Rs. 1,-
24,768.

ALDEHYDE C12 : From FRG:
N. Ranga Rao & Sons, 90 kgs.,
Rs. 34,800.

ALLYL CAPROATE : From UK:
Bush Boake Allen (I) Ltd., 300
kgs., Rs. 70,191.

AMPICILLIN SODIUM
STEARATE: From Spain: Armour
Pharmaceuticals (P) Ltd., 50
kgs., Rs. 89,170.

ANTIMONY TRICHLORIDE :
From USA: Shriram Fibres Ltd.,
965 kgs., Rs. 7,35,707.

AROMATIC CHEMICALS :
From FRG: Mahendra Perfumery
Works, 125 kgs., Rs. 29,000.

BIO CHEMICALS: From USA:
J. Mehta & Co., 9 Lbs., Rs.
70 Dr. G. Shanmugam, 15 kgs.,
Rs. 22,267; Vijaya Hospital, 6
kgs., Rs. 7,664.

BUTYL CARBITOL : From Sin-
gapore : Hi-Q Electronics Pvt.
Ltd., 1,200 kgs., Rs. 50,271.

BUTYLATED P CRESOL :
From France : S & S Filled Fi-
bres Ltd., 600 kgs., Rs. 54,386.

CALCIUM D PANTOTHENATE:
From FRG: Eros Pharma Pvt. Ltd.,
100 kgs., Rs. 23,253; From Ja-
pan: Kampha Labs., 100 kgs.,
Rs. 22,305.

CALCIUM SILICIDE: From Italy:
The Metal Powder Co. Ltd., 20,-
000 kgs., Rs. 4,32,402.

CARBAZOLE : From Japan :
Vanavil Dyes & Chemicals Ltd.,
5000 kgs., Rs. 3,12,668.

CARBON BLACK : From Chi-
na: Premier Tyres Ltd., 20,000
kgs., Rs. 2,06,124.

CELLULOSE ACETATE : From
FRG: Kothari Electronics Inds.
Ltd., 450 kgs., Rs. 1,16,063.

CHLORMEZANONE : From Ja-
pan: Chemech Laboratories Ltd.,
25 kgs., Rs. 24,425.

COUMARIN : From Belgium :
N. Ranga Rao & Sons, 3000 kgs.,
Rs. 7,35,388.

3 CYANOPYRIDINE : From Ja-
pan: Hanson Drugs Ltd., 2,000
kgs., Rs. 1,47,687; Veer Chemie
& Aromatics Ltd., 2.4 MT., Rs.
1,64,604.

4 HYDROXY BENZOTRIFLUORIDE : From UK : Tamilnadu Dadha Pharm. Ltd., 2 kgs., Rs. 20,420.

HYDROXY PHENYL ACETAMIDE: From Japan: Meridan Pharmaceuticals Pvt. Ltd., 150 kgs., Rs. 1,09,922.

HYDROXYLAMINE SULPHATE: From Japan: Plant Organics Ltd., 17,500 kgs., Rs. 4,81,964 ; Standard Organics Ltd., 25,000 kgs., Rs. 9,35,296.

ISOBUTYL ISOBUTYRATE : From USA: Addisons Paints & Chemicals Ltd., 10 kgs., Rs. 176.

ISONONYL ACETATE: From FRG: Sarathy Perfumery Works, 100 kgs., Rs. 10,027.

ISOPHTHALIC ACID : From Belgium: Naphtha Resin & Chemicals Pvt. Ltd., 20,000 kgs., Rs. 2,88,668.

ISOPROPYL ALCOHOL : From China : Shasun Drugs, 26,600 kgs., Rs. 2,50,691.

L-LYSINE MONOHYDROCHLORIDE: From Korea: Sunnex Commercial Pvt. Ltd., 2 MT., Rs. 1,27,894.

LAB CHEMICALS : From FRG: Astra Research Centre, 53 Nos. Rs. 81,529; From Hong Kong: Sri Gokulam Hospitals Pvt. Ltd., 3 Nos., Rs. 1,103.

LAURYL CHLORIDE : From Japan: Peroxides India Ltd., 720 kgs., Rs. 31,791.

LACTIC ACID: From New Zealand: Sellam Chemicals, 500 kgs., Rs. 36,617.

LAB CHEMICALS: From Sweden: Astra Research Centre, 73 Nos., Rs. 1,47,737; From USA: Astra Research Centre, 1 No. Rs. 877; H. Chandamal & Co., 74

Nos., Rs. 62,610; The Kasturba Medical College, 3 Nos., Rs. 12,455.

LINALOOL: From Switzerland: Fradhan Perfumes, 525 kgs., Rs. 76,166.

LITHOPONE : From China: Tirupathi Industries, 2,000 kgs. Rs. 9,135.

LYRAL : From USA : Padmi Products 400 kgs., Rs. 1,04,630.

MERCAPTO BENZIMIDAZOLE: From Japan: Shriram Fibres Ltd. 1,850 kgs., Rs. 3,27,630.

METHONYL TECHNICAL: From USA: Coromandel Industries Products Ltd., 38,400 kgs., Rs. 1,05,23,808.

METHYL ACETO ACETATE: From Japan: Shasun Chemicals Pvt. Ltd., 16 MT., Rs. 3,76,949.

N-ACETYL SULPHANILYL CHLORIDE: From Japan: Plant Organics Ltd., 8 MT., Rs. 3,89,771.

ORTHO PARA TOLUENE SULFONAMIDE: From Korea: Reichhold Chemicals India Ltd., 1,000 kgs., Rs. 43,850.

ORTHOXYLENE: From Brazil: Thirumalai Chemicals Ltd., 2,481.048 MT., Rs. 2,43,64,868.

PENCILLIN G AMIDASE : From FRG: TTK Chemicals Ltd., 6 kgs. Rs. 3,89,347.

PHENOL : From USA: Madras Refineries Ltd., 72 Nos, Rs. 11,167.

PHOSPHOROUS PENTACHLORIDE : From FRG: Escorts India Ltd., 2,415 kgs., Rs. 2,09,379.

POLYBUTYLENE TEREPHTHALATE: From Japan: Electronic Research Ltd., 800 kgs., Rs. 99,436.

POLYETHYLENE : From Italy: Transplastics (India) Ltd., 13,500 kgs., Rs. 2,88,940.

POTASSIUM SULPHATE: From France: Tribology India Ltd., kgs., Rs. 7,554.

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PREDNISOLONE: From Netherlands: Medopharm 25 kgs., Rs. 95,028.

PROPANTHELINE BROMIDE P: From FRG: Siri Pharma, 50 kgs., Rs. 44,154.

PYRIDINE HYDROBROMIDE: From UK: Agpi Chemicals 2 MT., Rs. 2,29,369.

SODIUM ALGINATE: From Norway: Pyrax Polymers, 559 kgs., Rs. 80,970.

SODIUM METAL: From Japan: Priya Chemicals Ltd., 8.32 MT., Rs. 2,69,819.

SULPHUR INSOLUBLE: From FRG: Dunlop India Ltd., 10,000 kgs., Rs. 3,05,035; Midas Pre-cured Treads Pvt. Ltd., 2,000 kgs., Rs. 66,162; Zens Rubber Pvt. Ltd., 2 MT., Rs. 66,162.

TANTALUM PENTOXIDE: From Singapore: General Optics Asia Ltd., 500 Gms., Rs. 16,955.

TERTIARY BUTANOL: From P.O. Tamilnadu Dadha Pharmaceuticals Ltd., 4,030 kgs., Rs. 98,690.

TITANIUM DIOXIDE: From Switzerland: Vijay Paints Company, 15 kgs., Rs. 1,507.

TOLUENE: From USA: Bharat Electronics Ltd., 4 Ltr., Rs. 1,053.

TRICHLORO ETHYLENE: From Japan: Kuni Engg. Co. Ltd., 6,000 kgs., Rs. 78,243.

TRIMETHOXY BENZALDEHYDE: From China: Prasad Drugs Pvt. Ltd., 1,500 kgs., Rs. 4,70,465.

3,4,5 TRIMETHOXY BENZALDEHYDE: From Hong Kong: Savera Laboratories Pvt. Ltd., 1,500 kgs., Rs. 4,91,020; From Netherlands: Inventaa Chemicals Pvt. Ltd., 9.52 MT., Rs. 33,61,811.

TRIMETHYL PHOSPHITE: From USA: Indag Products Ltd., 78,944.4 kgs., Rs. 27,05,236.

TRIMETHYLOETHANE: From USA: Kerala Minerals & Metals Ltd., 1,000 kgs., Rs. 32,017.

VANILLIN: From Belgium: N. Ranga Rao & Sons, 1,000 kgs., Rs. 2,26,098.

ZINC OXIDE: From FRG: Vikram Tyres Ltd., 5,000 kgs., Rs. 2,13,156.

ZINC OXIDE POWDER: From Singapore: W.S. Industries (I) Ltd., 10,000 kgs., Rs. 2,78,075.

MATERIALS IMPORTED MADRAS

(From 10-3-1989 to 18-3-1989)

ACETONITRILE 99.5%: From China: Kanilal Manilal & Co., 12,000 kgs., Rs. 1,91,840.



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ALPHA OLEFIN SULPHONATE: From Belgium: Chemicals & Plastics India Ltd., 36,000 kgs., Rs. 4,37,704.

ALUMINIUM HYDROXIDE GEL: From FRG: Indian Veterinary Research Inst., Rs. 1,500 kgs., Rs. 1,47,428.

ANTIMONY TRIOXIDE: From Singapore: Omega International, 18,000 kgs., Rs. 2,74,057.

AROMATIC CHEMICAL: From France: N-Ranga Rao & Sons., 275 kgs., Rs. 71,319; From FRG: Karnataka Soaps and Detergents Ltd., 600 kgs., Rs. 31,965; From Netherlands: Rajalakshmi Perfumery Works, 300 kgs., Rs. 50,244; From UK: N. Ranga Rao & Sons., 600 kgs., Rs. 1,57,648.66.

BIO CHEMICALS: From USA: Christian Medical College, 39 Lbs., Rs. 44,880.

BROMOCHLORO DIFLUOROMETHANE: From UK: Steelage Industries Ltd., 4,680 kgs., Rs. 2,31,579.

BUTACHLOR TECH: From USA: Tropical Agro Systems Pvt. Ltd., 31,745.44 kgs., Rs. 13,83,346.

CARBON BLACK: From Singapore: Vikrant Tyres Ltd., 50,000 kgs., Rs. 4,49,150.

CELLULOSE ACETATE BUTYRATE: From USA: Tokushu Menon Paper Mfg. Co., Ltd., 958 kgs., Rs. 71,389.

CHLOROACETYL CHLORIDE: From Switzerland: Siris India Ltd., 33 MTs., Rs. 8,21,990.

DESMODUR-R: From FRG: Meeenakshi Mouldings Pvt. Ltd., 120 kgs., Rs. 22,221.

DEXTRAN: From FRG: Hindustan Photofilms Mfg. Co. Ltd., 1.800 MTs., Rs. 7,98,587.

2,6 DIETHYL ANILINE: From Switzerland: Siris India Ltd., 14.820 MTs., Rs. 6,18,932; From USA: Siris India Ltd., 27,760 MTs., Rs. 11,59,350.

DIMETHYL CARBONATE: From France: IEL Ltd., 2,000 kgs., Rs. 71,256.

DIMETHYL SULPHOXIDE: From Japan: Deccan Drugs Ltd., 7,920 kgs., Rs. 1,94,625.

DIPHENYL METHANE DI ISOCYANATE: From Japan: Tranquill Rubber Sales Ltd., 20 kgs., Rs. 864; From Netherlands: Ure-

thane India Ltd., 14,400 kgs., Rs. 6,13,889.

ETHANOLAMINE: From Singapore: Micropack Ltd., 200 Ltr., Rs. 8,536.

FORMIC ACID 85%: From FRG: Ven Ponn Tannery, 60,480 kgs., Rs. 5,24,875.

GAMMA FERRIC OXIDE: From Japan: Murugappa Electronics Ltd., 3,000 kgs., Rs. 1,79,932; From Singapore: Prakash Pipes and Inds. Ltd., 13,000 kgs., Rs. 9,92,287.

GLYCERYL MONOSTEARATE: From Japan: Litelon Ltd., 1 MT., Rs. 69,124.

GUAIACOL: From Japan: M/s. Synthokem, 3,000 kgs., Rs. 2,62,639.

GUM BENZOIN: From Singapore: C. Palaniappan & Sons, 1,549 kgs., Rs. 34,296; S. K. Palanisamy & Co., 823 kgs., Rs. 17,062; Union Trading Co., 2,296 kgs., Rs. 40,083; Universal Enterprise, 1,395 kgs., Rs. 21,059.

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Fibres Ltd., 35 MTs., Rs. 10,-
57,622.

HYDROCHLORIC ACID : From
Singapore: Micropack Ltd., 950
Lbs., Rs. 33,584.

HYDROGEN PEROXIDE: From
Singapore: Micropack Ltd., 140
Lts., Rs. 7,616.

HYDROSULPHITE CONC: From
FRG: M/s. Allchems, 20 MTs.,
Rs., 2,53,656.

HYDROXYLAMINE SULPHATE
MIN 98% : From USA: Standard
Organics Ltd., 16 MTs., Rs. 4,-
57,981.

4 HYDROXY PHENYL ACETA-
MIDE: From UK : IEL Ltd., 595
kgs., Rs. 4,06,447.

LABORATORY CHEMICALS :
From UK: The Kasturba Medical
College 104 Nos., Rs. 48,324;
From USA: National Instt. of Nu-
trition, 5 gms., Rs. 2,576.

LYSINE MONOHYDROCHLO-
RIDE: From Korea: K.R.V. Agen-
cies., 1,000 kgs., Rs. 63,947.

MANGANESE OXIDE : From
Belgium: Hilversun Electronics,
3,000 kgs., Rs. 1,34,465.

METHACRYLATE MONOMER:
From USA: Delhi Acrylic Mfg.
Co. Pvt. Ltd., 15,000 kgs., Rs.
1,48,448.

METHYL ACETO ACETATE :
From Japan: Shasun Chemicals
Madras Pvt. Ltd., 32,000 kgs.,
Rs. 7,53,898; Vani Chemicals and
Intermediates, 16 MTs., Rs. 3,-
94,185; From USA: Shasun Che-
micals Pvt. Ltd., 30,698 kgs.,
Rs. 6,97,126.

MONOCHLOROACETIC ACID :
From FRG: Chandra Pharmaceuti-
cals Ltd., 16,500 kgs., Rs. 2,81,-
366.

MONOCROTOPHOS TECH :

From China: Gujarat Agro Ind.
Corpn. Ltd., 16,280 kgs., Rs.
14,17,589.

N-ACETYL SULPHANILYL
CHLORIDE : From Japan: IEC
Chemie Tech Pvt. Ltd., 11,000
kgs., Rs. 5,35,935; Vogel Labo-
ratories Pvt. Ltd., 13 MTs., Rs.
6,03,612; Standard Organics Ltd.,
40 MTs., Rs. 17,56,768.

ORTHO DICHLORO BENZENE:
From Japan: Dr. Reddy's Lab
Ltd., 16,500 kgs., Rs. 4,23,201.

PARA TERTIARY BUTYL BEN-
ZOIC ACID : From Japan: Addi-
son Paints and Chemicals, 3,000
kgs., Rs. 1,57,625.

PHOSPHORIC ACID: From Sin-
gapore: Micropack Ltd., 160 Ltr.,
Rs. 9,908.

POTASSIUM HYDROXIDE :
From Singapore: Micropack Ltd.,
420 Ltr., Rs. 30,086.

ISO PROPYL ALCOHOL : From
China: Chandra Pharmaceuticals

Ltd., 51,200 kgs., Rs. 5,22,283;
From Singapore: Micropack Ltd.,
40 Ltr., Rs. 3,736.

REAGENTS : From USA : Na-
tional Institute of Nutrition, 500
gms., Rs. 9,863.

SULPHADIAZINE: From China :
Malladi Drugs & Pharmaceuticals,
1,000 kgs., Rs. 2,23,814.

SULPHURIC ACID: From Singa-
pore: Micropack Ltd., 120 Ltr.,
Rs. 10,453.

SULPHUR: From Kuwait: EID
Parry (I) Ltd., 2,000 MTs., Rs.
40,56,699; Shaw Wallace and
Co., 1,731.7 MTs., Rs. 35,12,-
491; Tamilnadu Fluorine & Allied,
2000 MTs., Rs. 40,56,699.

SULPHUR INSOLUBLE : From
FRG: Dunlop India Ltd., 13,500
kgs., Rs. 4,11,797; MRF Ltd.,
40,500 kgs., Rs. 12,28,285.

TERPENE HYDROCARBONS :
From USA: The Flavours India
Pvt. Ltd., 540 kgs., Rs. 30,749.

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KUPWAD-416 425
Dist Sangli, (Maharashtra).

TETRADIFON TECH: From Netherlands: Coromandel Indag Pvt. Ltd., 2,000 kgs., Rs. 3,69,997.

TETRAMETHYL THIURAM DISULFIDE: From China: MRF Ltd., 7,000 kgs., Rs. 3,28,541.

THIONYL CHLORIDE : From FRG: IEL Ltd., 16,800 kgs., Rs. 1,83,330.

THYMOL: From France: Sanghvi Bhoormal Chunilalji, 1,000 kgs., Rs. 1,00,716.

TITANIUM DIOXIDE : From Switzerland: Vijay Paints & Pigments Co., 120 kgs., Rs. 22,055.

TRICHLOROETHYLENE : From Japan: Wheels India Ltd., 16,500 MTs., Rs. 2,82,871.

3,4,5, TRIMETHOXY BENZALDEHYDE: From Netherlands: Inventaa Chemicals Pvt. Ltd., 4,040 kgs., Rs. 17,35,772.

ZINC OXIDE: From France: MRF Ltd., 13,000 kgs., Rs. 3,23,398.

PLASTIC MATERIALS IMPORTED MADRAS

(From 10-3-1989 to 18-3-1989)

EPOXY RESIN: From Japan: Electronic Research Ltd., 300 kgs., Rs. 73,711; Suchitra Electronics Ltd., 6,500 kgs., Rs. 4,15,654.

HDPE : From Saudi Arabia : Continental Plastic Inc., 24,750 kgs., Rs. 3,86,250; Vat Plastics, 17.15 MTs., Rs. 2,96,367; From Singapore: Shameema Enterprises, 17 MTs., Rs. 2,60,008; From UAE: M/s. Indo National Limited, 17,150 kgs., Rs. 2,71,561.

PVC RESIN (PASTE GRADE): From Korea: Fenoplast Pvt. Ltd., 50 MTs., Rs. 10,09,999

PHENOLIC RESIN: From USA: MRF Limited, 454 kgs., Rs. 15,531.

POLYACETYL RESIN: From Japan: Zip Industries Pvt. Ltd., 200 kgs., Rs. 8,527.

POLYPROPYLENE: From France: M.M. Rubber Company Limited 200 kgs., Rs. 4,429; From Japan: Simco Engineering Ltd., 15 MTs., Rs. 3,30,338; From Korea: Gem Properties Ltd., 31 MTs., Rs. 4,96,548; From Korea: Kamath Packaging Pvt. Ltd., 62 MTs., Rs. 9,94,265; Safepack Polymer Ltd., 77.5 MTs., Rs. 12,41,767; Sheba Polysacks Pvt. Ltd., 31 MTs., Rs. 4,99,577; From Singapore: Hindustan Plastics Pvt. Ltd., 16 MTs., Rs. 2,75,276; Ultramarine and Pigments Ltd., 16 MTs., Rs. 2,47,419; VPA Ayyemperumal Nadar Sons, 16,500 kgs., Rs. 2,86,390.

POLY TETRAMETHYLENE ETHER GLYCOL: From Belgium: Urethane India Ltd., 15,600 kgs., Rs. 9,18,002.

DRUG MATERIALS IMPORTED MADRAS

(From 10-3-1989 to 18-3-1989)

CARBAMAZEPINE: From Hong Kong: Medispan Ltd., 50 kgs., Rs. 60,917.

LINCOMYCINE HCL BP : From China: Alved Products, 50 kgs., Rs. 1,51,312.

SULPHADIAZINE BP 80: From China: Malladi Drugs & Pharmaceuticals Ltd., 1,000 kgs., Rs. 2,28,814.

TAMOXIFEN CITRATE BP 80 : From FRG: Tamilnadu Dadha Pharm L.d., 7 kgs., Rs. 3,64,507

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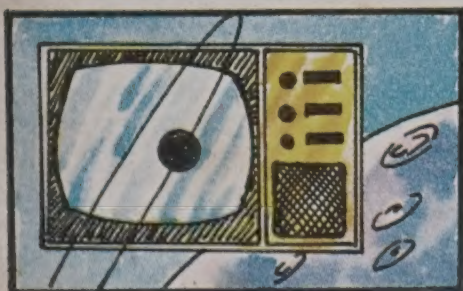
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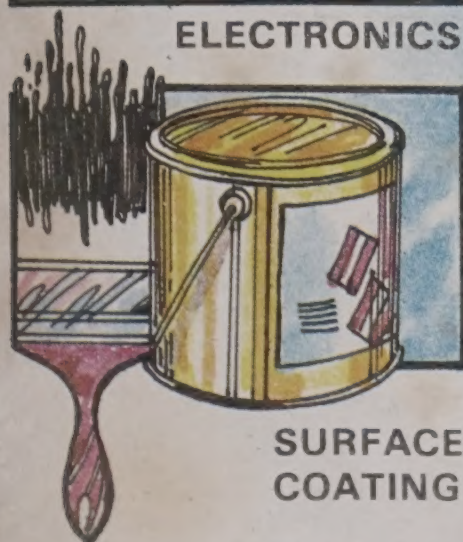
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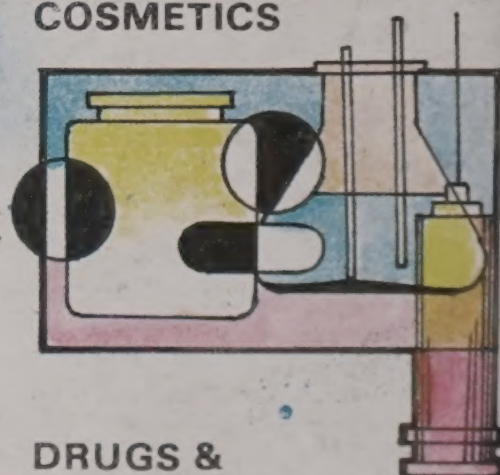
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